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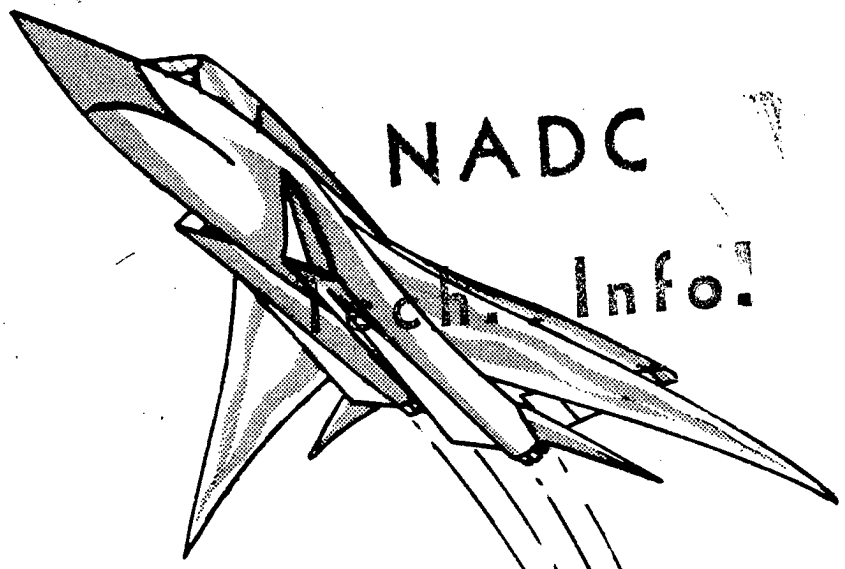


AVIONICS READINESS PROGRAM FOR 1980-2000

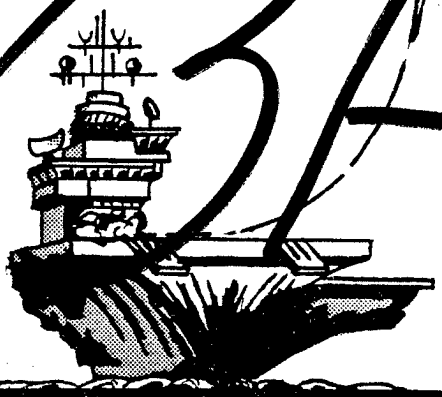
DEVELOPED FOR
NAVAL AIR SYSTEMS COMMAND
BY NAVAL AIR DEVELOPMENT CENTER

IMPLEMENTATION PLAN

VOLUME II A

MANAGEMENT OVERVIEW

JUNE 75



Naval Air Development Center
Warminster, Pennsylvania 18974

READINESS

"Overall Fleet and individual unit readiness is our most important goal. The only true measure of the Navy's value to the nation shall always be its ability to respond on short notice to carry out its mission - whatever the place, time or circumstances."

ADM James L. Holloway III

Abstract

Volume II, Implementation Plan for the Avionics Readiness Program, provides the Navy with the capability to specify support requirements for avionics equipments with the same confidence and to the same degree to which performance requirements are now specified. The objective of this plan is to provide the basis upon which the capability for specifying support can be firmly established. To accomplish this end, the plan is designed to develop the techniques for the inclusion of support requirements at the SRA design level and to demonstrate this capability to application of the design techniques developed in an integrated system design effort. In conjunction with these tasks will be the development of effective engineering/readiness/cost management techniques in the improvement of specification generation and procurement procedures, the latter to insure the demonstration of supportability as a co-equal requirement with performance as the criteria for final acceptance. The plan is structured so that all tasks proposed and scheduled are coordinated with each other and with future weapons systems applications, and can be implemented in total should Navy management so choose.

The plan is designed so that successful completion will see the establishment of a corporate memory for information, consultation and guidance to assist program managers in the formulation of cost effective support/performance tradeoffs decisions in the acquisition of major weapons systems planned for the years 1980-2000.

Near term impact and influence is anticipated. Readiness features developed within the program can be applied to ADM/EDM stages of programs currently under development to provide an iterative process through which the Readiness criteria being developed can be both tested and refined.

Executive Summary

The Avionics Readiness Program for the years 1980 to 2000 was initiated by the Naval Air Systems Command under AIRTASK A3400000/001D/5F41461408, dated 11 November 1974 and entitled "Avionics Readiness." The Naval Air Development Center has developed a plan for the Avionics Readiness Program under this AIRTASK. The plan is presented in two volumes: Volume I (General Plan) delivered to NAVAIRSYSCOM on 14 February 1975, and Volume II (Implementation Plan). Volume II has been incorporated into two major sections: Volume IIA (Management Overview) and Volume IIB (Task Descriptions). The purpose of this plan is to provide for the improvement of Avionics Readiness in the years 1980-2000. In general, the avionics readiness program is to determine the speed of technology growth and its impact on future systems and systems diagnostics; review long range weapons systems planning to determine those programs which can be impacted by the Avionics Readiness Program; and to identify requirements for diagnostics procedure development, packaging for maintenance, and intersystem fault detection.

The ability for future forces of all services to meet the threat posed by our adversaries will be dependent upon our ability to design and produce weapons systems which are available to respond to the threat at any given moments notice.

Recent studies[1] of major weapon systems indicate that the cost to maintain current prime electronic equipment is equivalent to the cost of acquisition of new weapon systems. The trend indicates that the cost of maintaining the equipment is increasing. In light of the current economic and energy crisis, unless this trend is reversed, it may be difficult to acquire new weapon systems to meet the latest threat in not-to-distant future.

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1 Electronics-X

There are a multitude of factors effecting readiness. It would be an impossible task to even attempt to identify all of the factors, determine the intricacies of their interrelationships, and attempt to solve all the problems. However, the success that has been achieved in obtaining performance suggests that similar success can be obtained in availability and readiness by applying the same method of precise and detailed requirements to the fundamental design and to obtain a satisfactory demonstration to specified requirements. This plan, therefore, attacks the very basis of this structure, the cost benefit/design concept of the avionics equipment.

The plan is therefore directed towards developing the capability for the Navy to confidently define and specify the design requirements for the inclusion of readiness features into future avionics systems. The plan is based upon the establishment of a firm technological base upon which design criteria must emanate. The application of this technology base provides the testing grounds to determine the practicability and capability to influence and impact design so as to have a favorable and enthusiastic response by industry to meet the Navy's requirements. This application of design is considered from two aspects: the ability to design prime avionics equipments as well as the capability to minimize dependence on external or special support influence, yet imposing the same criteria in the supporting elements as are imposed upon the prime equipment. Initially then, the plan develops the techniques for the inclusion of support requirements at the SRA design level and demonstrates this capability through application of the design techniques developed in an integrated system design effort. In addition, to acquire the desired end item, it is necessary to insure the improvement of procurement guidelines and development of effective readiness/engineering/cost management tradeoffs and techniques.

The plan addresses this issue of procurement and provides the basis for the development of a new avionics specification which has within its text, the constraints and limitations on future weapons systems acquisitions which necessitate the potential supplier to design, develop and demonstrate readiness. A major influencing factor upon the overall acquisition must be the proper management of all cost factors beginning from the basic design concept in going through the total life cycle expectancy of the equipment.

Program Managers must have the tools available to assess tradeoff decisions with respect to support as well as mission requirements, schedules, etc., and determine the cost benefit of those decisions. This plan will provide that capability.

The plan defines 29 tasks which are grouped into six major areas:

1. Technology assessment
2. Technology applications
3. Systems tradeoff and design
4. Specifications and procurement
5. Cost management
6. Readiness goals and measures

Each task is structured in a coordinated and interrelated manner with all other appropriate tasks.

The tasks are scheduled so that the first year activities lead to a preliminary set of guidelines, procurement specifications, and support concepts to be used in full system studies and the procurement of selected advanced development equipments. Further study in each task then provides an update of information at the end of the second

year. Later effort emphasizes the tradeoff analyses and program validation with feedback from the system applications to the cost management and readiness goals. Final effort shows the integration of all avionics readiness program tasks and the input to specifications and other readiness implementation documents.

The Naval Aviation Plan indicated that the acquisition of a number of major weapons systems is planned for the 1980-2000 time frame. In order to influence the design of these systems, it is imperative that this plan be implemented immediately. This plan will provide for dramatic avionics readiness improvements and reduce support costs in next generation weapon systems by:

a. Including critically selected test, maintenance and support features, as an integral part of the avionics end item.

b. Performing simultaneous development of the avionics end item and all material and soft elements that form its support system under a common design regime and to common cost goals.

c. Requiring demonstration of the supportability of the avionics end item prior to acceptance.

Each task area proposed by this plan is part of an integrated whole and is based on the following tenents:

a. The design of the avionics end item is the control element in the determination of all subsequent levels of support and readiness capability. Irreversible life cycle readiness capability and support requirements are established at the avionics design table.

b. The design of the readiness and support system and all related elements must be performed simultaneously with the design of avionics end item, and both should be performed under a common architecture and regime.

c. All design of avionics end items and associated readiness and support systems must be performed to a common cost objective.

d. Support and readiness requirements should be subjected to the same degree of detailed and quantization in the avionics specification as the function and performance parameters. Measurement, evaluation and acceptance of the readiness and support function in avionics should be executed to the same rules and degree as the functional and performance parameters.

This plan is designed so that it should be implemented as a total effort as opposed to the reduction or elimination of any one section. It is designed with the following prioritization of tasks:

a. Technology Assessment and Cost Management - These tasks are first priority so as to develop the design critieria for the demonstration of readiness features at the SRA level and to establish the methodology for cost benefit credibility within the earliest possible time period.

b. Readiness Goals and Measures - These tasks are intended to relate the operational environment to the laboratory and therefore, will provide inputs to the technology assessment. It will also provide guidance and direction for the Avionics Readiness Program in the establishment of readiness measure requirements.

c. Specifications and Procurement - These tasks can be initiated after program start since the early efforts are directed towards determining the present techniques for specifications. It will have a greater impact downstream in the program.

d. Technology Application and System Tradeoff and Design - These tasks are dependent upon inputs from the other tasks within the overall program with exception of the Human Factor area which should have early start because it is important to the design effort at the SRA level.

Within these priorities, each task proposes a joint responsibility between the Navy and the Industrial community. Industry must be responsive to the requirement to develop equipments which are reliable, maintainable and supportable with these features being demonstrated prior to acceptance by the Navy. Likewise the Navy must be capable of specifying accurately, distinctly and without conflict, the design requirements to meet the readiness goals as well as to be able to provide incentive for successful results and penalties for failures.

The plan further proposes a joint responsibility by all Naval Laboratories associated with the design, development, and procurement of avionics weapons systems.

Acknowledgements

The development and production of Volume I, General Plan and Volume II, Implementation Plan was the result of a concentrated effort by NAVAIRDEVCEN personnel and expert opinions and assistance from both the Navy Laboratories and Industry. In consideration for their contributions, the following individuals are recognized:

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VOLUME IIA

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(a) AIRTASK No. A340000/001B/5F53537402 of 18 Feb 1975

(b) AIRTASK No. A3400000/001B/5F41461408 of 17 Oct 1974

(c) NADC ltr 503-941 of 13 Feb 1975

1.0 Program Definition

1.1 Introduction

The Avionics Readiness Program, Volume II, Implementation Plan, was developed by the Naval Air Development Center, Warminster, Pennsylvania, for the Naval Air Systems Command under the sponsorship of AIR-340E. The authorization for the plan development is contained in AIRTASK No. A340000/001B/5F53537402 of 18 February 1975 (reference (a)). Volume II, Implementation Plan, has been incorporated in these documents:

a. Volume IIA, Management Overview - This document is a summary of the Work Statements, Schedules and Resource Requirements for a five year development effort to meet the objectives set forth in the Airtask; the improvement of Avionics Readiness in the years 1980-2000. This document also contains a recommended Project Organization for the direction and control of the ARP (Avionics Readiness Program) and to serve as the source for information consultation and guidance on Readiness related matters developed by this Plan.

b. Volume IIB, Task Descriptions - This document is the body of the plan. Each major section is defined in detail by the individual tasks necessary to meet the objectives outlined in the Work Statement. Included with the task descriptions are the milestones, interfaces, and relationships to other tasks and sections within the ARP. Each task also provides the detailed resource requirements (manpower, funding) and schedule both by task and within the context of the ARP.

1.2 Background

The development of the Avionics Readiness Plan was initiated by NAVAIRSYSCOM, AIR-340E by AIRTASK No. A3400000/001B/5F41461408 of

17 October 1974 (reference (b)). The purpose of the Airtask was to develop a long range plan for the improvement of Avionics Readiness in the years 1980-2000. The objectives were:

a. Technology Assessment/Forecast - Determine the direction and speed of technology growth and its impact on future systems and systems diagnostics.

b. Future Operational Requirements - Review long range weapon systems planning to determine those programs which can be impacted by the Avionics Readiness Program.

c. Diagnostics Maintenance - Identify requirements for diagnostic procedure development, packaging for maintenance, and inter-system fault detection.

1.2.1 Additional Scope

In pursuit of development of the Plan to meet the Airtask objectives, it became quickly evident that the scope of the task should be broadened to include:

a. Specifications and Procurement - Methods for specification, procurement and acceptance of advanced Avionics Readiness capability should be developed. In this regard, quantitative values and their measurement techniques for all readiness and readiness related parameters will be developed. These values will be suitable for use in development, procurement specifications and evaluation. Warranty programs will be evaluated.

b. Cost Management - Cost factors, measurements and methods for all elements of Avionics Readiness as applied to advanced technologies will be developed. Program cost methodologies such as Design to Cost or Life Cycle Cost techniques will be developed and refined as engineering tools and as visibility aids to system and program management specifically as they relate to readiness tradeoffs.

1.2.2 Plan Portioning

In addition to broadening the scope of the effort it was further decided to divide the Avionics Readiness Plan into two parts:

a. Volume I - General Plan - This portion of the plan would address the primary issues and suggest approaches to be considered to meet the objectives of the Airtask. Volume I was designed to set the tones of the program and to provide guidance and direction to the overall plan.

b. Volume II - Implementation Plan - This portion of the plan would provide the detailed task descriptions, schedules and resource summaries necessary to achieve solutions or resolve the issues defined in Volume I.

1.2.3 Results

Volume I, General Plan, was completed and delivered to NAVAIR-SYSCOM on 14 February 1975 (reference (c)). Volume I has received wide distribution and has generated considerable interest within both the Navy and the Industrial Community. Successful completion of Volume I resulted in the generation of the Airtask (reference (a)) to develop Volume II.

1.3 Approach

The plan defines twenty-nine tasks which are grouped into six major areas. The major areas are consistent with five of the sections defined in Volume I. A review of the task details of Volume I indicated the need to realign some of the subtasks into other areas for a more consistent approach to the problem. The Task Organization is shown in figure 1.

TECHNOLOGY ASSESSMENT 1.0	TECHNOLOGY APPLICATIONS 2.0	SYSTEMS TRADEOFF AND DESIGN 3.0	SPECIFICATIONS AND PROCUREMENT 4.0	COST MANAGEMENT 5.0	READINESS GOALS AND MEASURES 6.0
1.1 BASIC ELEMENTS	2.1 AIRCRAFT SYSTEMS TEST	3.1 HUMAN FACTORS	4.1 SPECIFICATIONS	5.1 COST CREDIBILITY	6.1 ARP DEFINITION
1.2 TEST AND REPAIR	2.2 SCT VERSUS SHOP TEST	3.2 AVIONICS TESTING	4.2 PRE–ACCEPTANCE DEMONSTRATION	5.2 COST TARGETS	6.2 PARAMETERIZATION QUANTIFICATION
1.3 TECHNOLOGY PROJECTION	2.3 SCT/RELIABILITY TRADES	3.3 WEAPONS SYSTEM SUPPORT	4.3 WARRANTIES	5.3 COST ESTIMATING	
1.4 MANUFACTURING AND SOURCES	2.4 SHOP TEST REQUIREMENT	3.4 SUBSYSTEM IMPLEMENTATION		5.4 SHIFTING COST CENTERS	
		3.5 WEAPONS SYSTEM SUPPORT DESIGN		5.5 COST INDICES	

FIGURE 1 - Task Organization

1.3.1 Task Organization

a. Technology Assessment - This section will provide the basis for the program. This effort will concentrate on the investigation and development of testability in basic analog and digital circuitry. As part of this task, attempts will also be made to determine the "digitizing" of historically analog circuitry. Packaging techniques will be investigated. The result anticipated is the development of functional modularity, testability and maintainability of features in SRA's designed with advanced technological devices. Additionally, methods for the effective generation of software will be investigated for both Operational and Support software.

A technological and schedule projection will be prepared which will identify the types of components which will be readily available in the 1980-2000 time frame.

b. Technology Application - The task will define the requirements for the most effective mix of ATE (Automatic Test Equipment) and SCT (Self Contained Test). Analysis of future ATE requirements will be investigated and tradeoffs considered with SCT at all maintenance levels. The impact of SCT on reliability will also be investigated.

c. Systems Tradeoff and Design - The purpose of this task is to demonstrate Avionics Readiness through application of the developments of other sections within the program. As such, both subsystem and system design efforts will be pursued which will require inputs from other tasks. The results of the design effort will also provide the means to validate the individual developments.

Another and supporting effort to the design is the development of meaningful test and support capabilities from factory through O-level.

Relating all these issues is the effort planned in Human Factors. Although previously considered as an entity, it is an essential and integral part of the ARP.

d. Specifications and Procurement - This section provides the methodology which will be required to impact the present methods for specifying and procuring Avionics equipments. Initially, specifications will be reviewed to determine the redundancy, inconsistency, and contradictory approach to procuring equipment. A new family of specifications based on advanced technology is planned. These specifications will include those Readiness features developed in the ARP. It is through this method that Readiness can be incorporated into future procurements. Further, this effort will determine methods for assuring compliance with Readiness specifications prior to acceptance by the Navy. In conjunction with this effort, the issue of Warranties and its affect on Readiness will be investigated.

e. Cost Management - This section will develop a viable and valid methodology for effective management of the cost related aspects of ARP. In this effort, investigation of LCC (Life Cycle Cost) and DTC (Design to Cost) will be pursued. Based on the technology projection, shifting cost centers will be determined as well as the cost indices of technological development. Cost credibility techniques will be developed and applied to the system design planned within the program. CER (Cost Estimating Relationships) will provide the basis for planning and management of all cost related issues in future avionics procurements.

f. Readiness Measures and Goals - This effort will provide the guidance and direction to the program. Readiness factors will be identified and their relationships determined. Model development is planned to obtain an effective means to measure Readiness factors. In support of this latter effort, a data acquisition development is planned. Additionally,

the methodology to relate field parameters with laboratory design will be developed. RMS (Reliability, Maintainability, Supportability) factors will be parameterized and quantified.

This effort will be validated within the ARP. Results are anticipated early in the program and will be available for implementation into current or planned procurements.

1.3.2 Phase Development

The work flow has been organized into four phases to provide management visibility and control of the multi-faceted program. Through this method, task interaction, schedules and milestones may be tracked to insure program direction and progress in maintained. Figure 2 illustrates the approximate time frame for these phases and the major interactions between the task areas. The first year activities lead to a preliminary set of guidelines, procurement specifications, and support concepts to be used in full system studies and the procurement of selected advance development equipments. Further study in each task section then provides an update of information at the end of the second year. Phase III emphasizes the tradeoff analysis and program validation with feedback from the system applications to the cost management and readiness goals. The final phase shows the integration of all ARP tasks and the input to specifications and other readiness implementation documents. (Detailed tasks and milestones for each ARP section are provided in Volume IIB.)

The program phases are defined as follows:

a. Phase I - Assessment and Analysis - Includes the collection of data, assessment of technology and present methods, and the identification of alternatives. Overall goals and measures will be established for the

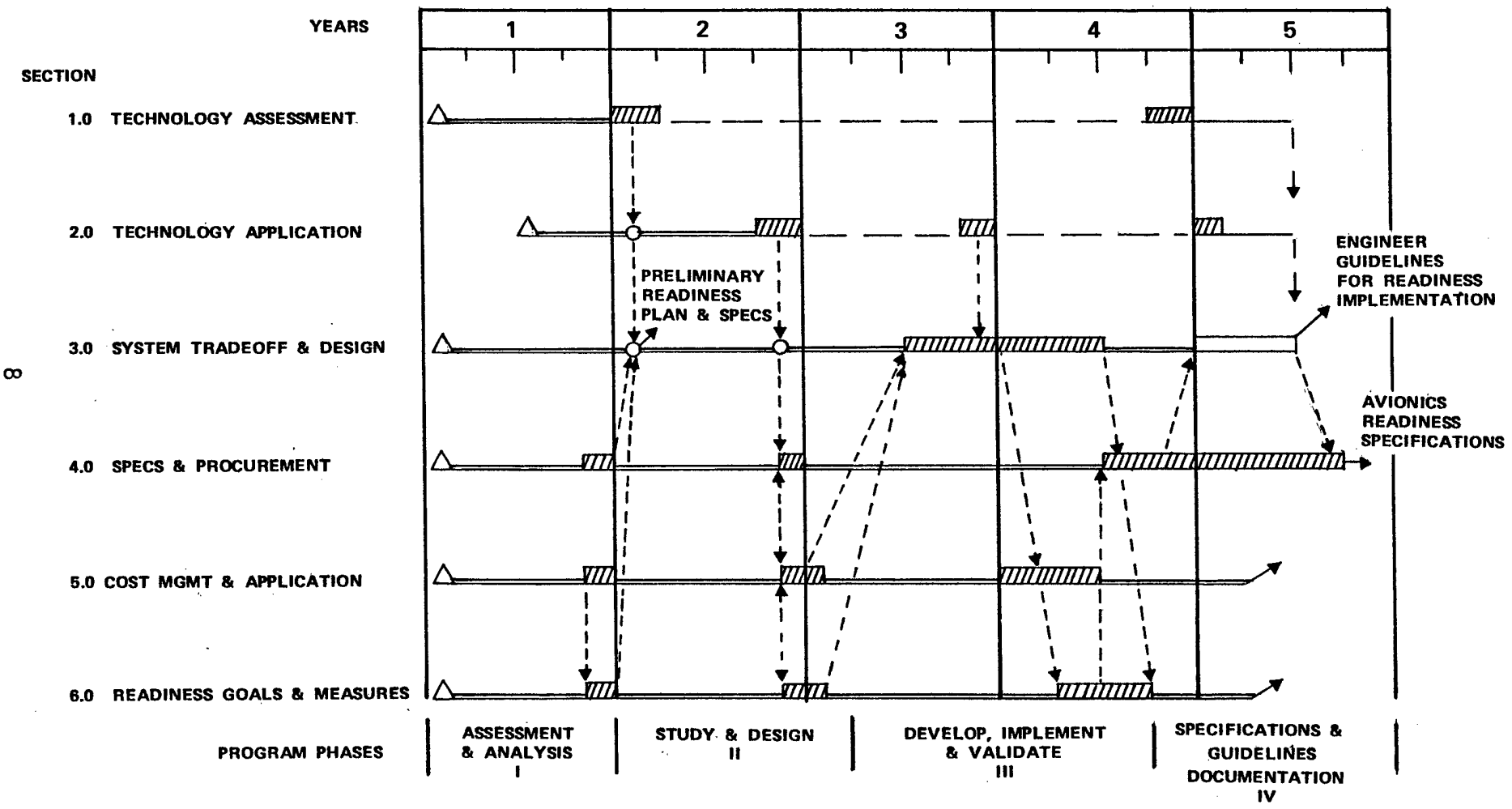

Figure 2. Generalized Work Flow.

program, and actual new development subsystems and a full weapon system will be selected for application and subsequent validation of ARP recommendations.

b. Phase II - Study and Design - Will initiate studies including design tradeoffs in testing techniques, readiness measures, cost estimating and specification requirements. A preliminary or baseline set of specifications and guidelines (including intuitive concepts) will be defined for the procurement of advanced development equipments in the demonstration or "model" weapon system.

c. Phase III - Development, Implementation and Validation - Will include the development of maintenance policies, design procurement requirements, support plans and design to cost procedures. Tradeoff studies will determine the more cost effective solutions. Theoretical and actual RMS results from the subsystem and weapon system applications will be analyzed to validate the readiness approach. Integration of the full Avionics Readiness plan will begin.

d. Phase IV - Specification and Guidelines Documentation - Provides for the final analysis, selection and documentation of design, procurement, support and management control requirements. A technology update assessment will be conducted to validate or modify earlier projections. Specifications and other Avionics Readiness instructions are completed for application in engineering development of the selected weapon system and for Navy-wide implementation.

1.3.3 Resource Requirements

To successfully pursue each task defined, a total of seven million dollars and approximately 1600 man months are required. The major portion of the costs is direct labor. Travel and computer costs make up the remainder with little or any material required. The effort is expected to be supported by industry under contract to the Navy. It is imperative, however, that the Navy maintain strict control and direction of the program to insure the goals set forth by the plan are achieved.

1.4 Conclusions

1.4.1 Scope of Effort

The scope of effort proposed by this plan is large and ambitious. The magnitude of the problem, improving Avionics Readiness, is overpowering. It therefore requires that any plan attack the whole problem in a coordinated and logical manner versus attempting a variety of short term programs to resolve the issues which confront the Navy today. This is not meant to imply that today's problems must not be solved, but one can quickly conclude that the total task of improving all current avionics weapons systems is beyond available funding. This plan proposes projecting today's problems into future procurements and to resolve the issues before the introduction of new weapons systems into the Fleet.

1.4.2 Resource Requirements

This plan proposes the expenditure of approximately seven million dollars over a five year period. In essence, this is an investment in the future. Those directly involved with the development of the plan are confident of its success. It remains, however, that any investment must be based on the best knowledge available at the time of investment. The program therefore proposes the initial effort and major expenditure at the onset be in the Technology Assessment area. The efforts expended in this area will provide the basis for all other efforts in the program.

1.4.3 Responsibilities

This plan proposes a joint responsibility between the Navy and the Industrial Community. Industry must be responsive to the requirement to develop equipments which are reliable, maintainable and supportable with these features being demonstrated prior to acceptance by the Navy. Likewise,

the Navy must be capable of specifying accurately, distinctly and without conflict, the design requirements to meet the Readiness goals as well as to be able to provide incentives for successful results and penalties for failures.

The Plan further proposes a joint responsibility by all Navy Laboratories associated with the design development and procurement of Avionics weapons systems.

1.4.4 Impact and Implementation

The success of the program can only be measured as new policies and requirements are applied and the resulting impact on Readiness observed. The precise degree of improvement over present Readiness may be difficult to determine because of the many varied opinions and levels of Readiness within the Navy structure. The results of this Plan can be implemented into ADM/EDM stages of avionics equipments as the results, once validated within the context of the program, become available. A firm and credible data base can only be established by introducing developed Readiness factors into major weapons systems procurement. The final decisions, however, rest with the Program Manager. The many aspects and factors of development with fixed resources tend to make the performance and schedule the driving factors. However, the implementation of this plan will provide the project manager with the tools necessary to provide production avionics and weapons systems that involve the readiness issues of the 1980-2000 period.

1.5 Recommendations

1.5.1 Program Initiation

Several major procurement programs have been scheduled for procurement prior to 1985. In order to impact these programs it is recommended that initiation of the tasks being in Fiscal Year 1976.

1.5.2 Prioritization of Tasks

The Plan should be implemented as a total effort as opposed to the reduction or elimination of any one section. It is recognized, however, that the total resources required may not be available in the immediate future. Therefore, the following prioritization of tasks is recommended:

a. Technology Assessment and Cost Management - These sections are first priority so as to develop the design criteria for the demonstration of Readiness features at the SRA level and to establish the methodology for cost effective credibility within the earliest possible time period.

b. Readiness Goals and Measures - This section is intended to relate the operational environment to the laboratory and therefore will provide inputs to the Technology Assessment. It will also provide guidance and direction for the ARP in the establishment of Readiness measurement requirements.

c. Specifications and Procurement - This section can be initiated after program start since the early efforts are directed towards determining the present techniques for specifications. It will have a greater impact downstream in the program.

d. Technology Application and System Tradeoff and Design - Both of these sections are dependent upon inputs from the other tasks within the overall program with the exception of Human Factors (Task 3.1) which should have an early start because it is important to the design effort at the SRA level.

2.0 Technical Approach

2.1 Work Breakdown Structure

2.1.1 General

The WBS (Work Breakdown Structure) shown in table 1 contains all of the tasks identified in the Plan. The tasks have been identified to the Level II effort with the exception of Section 1. This section was defined to the Level III effort to highlight the importance of establishing a firm technology data base upon which to support the program.

2.1.2 Responsibilities (Laboratory)

As recommended in the WBS, the P (Primary) indicates the laboratory which is considered the lead laboratory for that particular task. The S (Secondary) indicates that laboratory which has similar capabilities and upon which support can be drawn by the lead laboratory if required. The I (Interest) indicates those laboratories which are not expected to take an active role but should be kept informed as to the progress of the program. The delineation of responsibility is subject to review and revision by NAVAIRSYSCOM.

2.1.3 Responsibilities (Navy/Industry)

The P and S for Navy and Industry indicates that the major portion of the effort in this program will be done by industry on contract to the Navy. This does not imply that industry will have the primary responsibility with the Navy playing a secondary role.

WORK BREAKDOWN STRUCTURE

	NADC	NAEC	NAFI	NELC	NAVY	Industry
1.0 Technology Assessment						
1.1 Basic Elements	P	I	I	I	P	S
1.1.1 Analog Testability	S	P	S	I	S	P
1.1.2 Digital Testability	P	S	I	I	S	P
1.1.3 Software	S	P	I	I	P	S
1.1.4 Packaging	S	S	P	S	S	P
1.2 Test and Repair	S	P	S	S	S	P
1.3 Technology Projection	P	I	I	I	S	P
1.4 Manufacturing and Sources	P	I	S	I	S	P
2.0 Technology Applications						
2.1 Aircraft Systems Test	S	P	I	I	S	P
2.2 SCT vs Shop Test	P	S	I	I	S	P
2.3 SCT/Reliability Trades	P	S	I	I	S	P
2.4 Shop Test Rrequirements	S	P	I	I	P	S
3.0 Systems Tradeoff and Design						
3.1 Human Factors	P	I	S	I	P	S
3.2 Avionics Testing	P	S	I	I	S	P
3.3 Weapons System Support	S	P	I	I	S	P
3.4 Subsystem Implementation	P	I	S	I	P	S
3.5 Weapons System Design	P	I	S	I	P	S

P - Primary

S - Secondary

I - Interest

Table 1

WORK BREAKDOWN STRUCTURE

	NADC	NAEC	NAFI	NELC	NAVY	Industry
4.0 Specifications and Procurement						
4.1 Specifications	P	S	S	S	P	S
4.2 Pre-Acceptance Demonstration	P	S	S	S	S	P
4.3 Warranties	S	I	P	I	S	P
5.0 Cost Management						
5.1 Cost Credibility	P	I	S	I	P	S
5.2 Cost Targets	S	I	P	I	S	P
5.3 Cost Estimating	P	I	S	I	P	S
5.4 Sh fting Cost Centers	S	P	I	I	S	P
5.5 Cost Indices	P	I	S	I	S	P
6.0 Goals and Measures						
6.1 ARP Definition	P	I	S	I	P	S
6.2 Parameterization Quantification	P	I	S	I	S	P

P - Primary

S - Secondary

I - Interest

2.2 Resource Summary

The total resources required to support the Plan are summarized in figure 3. The cost of the program over the five year period is estimated at seven million dollars which translates to approximately 1600 man months of effort. The majority of the manpower is anticipated to be derived from industry with program control and limited effort expended from in-house sources. First year expenditure is estimated at two million dollars with the primary emphasis in the Technology Assessment area. The general work flow and relationship of each section is illustrated in figure 4.

2.2.1 Information Presentation

The resource requirements are presented in quarterly summary format for each section as identified in the WBS. Included in the data is the funding expenditure curve for the length of the task and the manpower requirements in a profile format. This method enables the reader to easily recognize the emphasis and relationship of each task within a section and each section within the total program. Details in monthly format and schedules are contained in Volume IIB, Task Descriptions. Also included in this presentation are the generalized flow diagrams indicating the relationship of the sections to one another as well as the approximate period of time within the five year period that the tasks impact or are impacted by each other.

		1				2				3				4				5				PROGRAM TOTALS
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM)																						
TECHNOLOGY ASSESSMENT	1.0	46.5	43.5	58	57	38	39	31	30	3				3				1				350
TECHNOLOGY APPLICATION	2.0	9	9	18	18	36	33	21	21	15	9	3	3	3	3							201
SYSTEM TRADEOFFS & DESIGN	3.0	14.25	14.25	14.25	14.25	23.75	23.75	21.75	23.75	31.25	29.25	28	28.5	22.5	21	18	18	12.5	10.5	9	7	586.5
SPECIFICATION AND PROCUREMENT	4.0	.5	9.3	12.1	14.9	18	16.3	15.5	16.6	14.6	13.5	13.5	14.1	14.1	14.1	13.5	13.5	12	9.5	9	7.5	252.1
COST MANAGEMENT AND APPLICATION	5.0	11.1	9	16	17	13	10	18	20.5	14	14	11	11	15.5	15	11.5	14.5	13	11.5	5	3.5	256.1
READINESS GOALS AND MEASURES	6.0	9	9	12	12	18	18	15	9	7.5	7.5	4.5	4.5	4.5	4.5	4.5	4.5	1.5	1.5	1.5	1.5	150
DIRECT LABOR (MM) TOTAL		90.35	94.05	130.35	133.15	146.75	140.05	122.25	120.85	85.35	73.25	60	61.1	61.6	57.6	50.5	50.5	39	33	21.5	19.5	1593.7
LABOR TRAVEL COST (K)																						
TECHNOLOGY ASSESSMENT	1.0	196.5	184.6	247.9	241.3	156.8	161.5	128.2	124	13				15				5				1173.8
TECHNOLOGY APPLICATION	2.0	38	37	75	75	150	137.5	88	87	63	37	12.5	12.5	12.5	12.5							837.5
SYSTEM TRADEOFFS & DESIGN	3.0	62.4	62.4	63.4	63.4	102.	101.9	93.7	101.5	132.1	123.7	118	119.7	94.9	88	74.7	75.8	52.6	44.1	38.8	29.4	1642.3
SPECIFICATION AND PROCUREMENT	4.0	2.7	43.2	58.2	77.9	85.1	78	74.5	79.5	70.4	67	67	68.6	67.6	66.6	63.6	63.7	57.7	48.3	46.9	37.9	1224.7
COST MANAGEMENT AND APPLICATION	5.0	47.5	39.7	69.6	87.4	67.4	50.5	85.1	95.2	60.2	59.9	48.6	48.2	63	65.1	61.7	61.2	54.7	47.8	20.8	14.3	1148.1
READINESS GOALS AND MEASURES	6.0	38	37	50	49	74	75	66	41	30	30	20	18	19	18	20	18	6	6	7	6	628
COMPUTER CHARGES (K)																						
TECHNOLOGY ASSESSMENT	1.0	5.4	5.4	5.4	6.0	5.4	5.4	6.0	6.0	0.0												45
SYSTEM TRADEOFF AND DESIGN	3.0			1	.5	.5				.5	1	.5	1	.5	1	.5						7
SPECS AND PROCURE	4.0			2.6	2.6	2.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	1.0								28.2
COST MANAGEMENT AND APPLICATION	5.0			1.5	7.5	5.8	3.9	4.7	4.7	.9	.9	1.2	1.2	1.2	1.5	.6	.6	.6				36.8
READINESS GOALS AND MEASURES	6.0			7	7	6.5	8.5	4.5	4.5			1.5	1.5	.5	.5	1						43
TOTAL COST (K)		590.5	409.3	579	615	653.5	622	550.1	543.4	370.1	319.5	269.3	270.7	274.2	253.2	222.1	219.3	176.6	146.8	113.5	87.6	7086.3

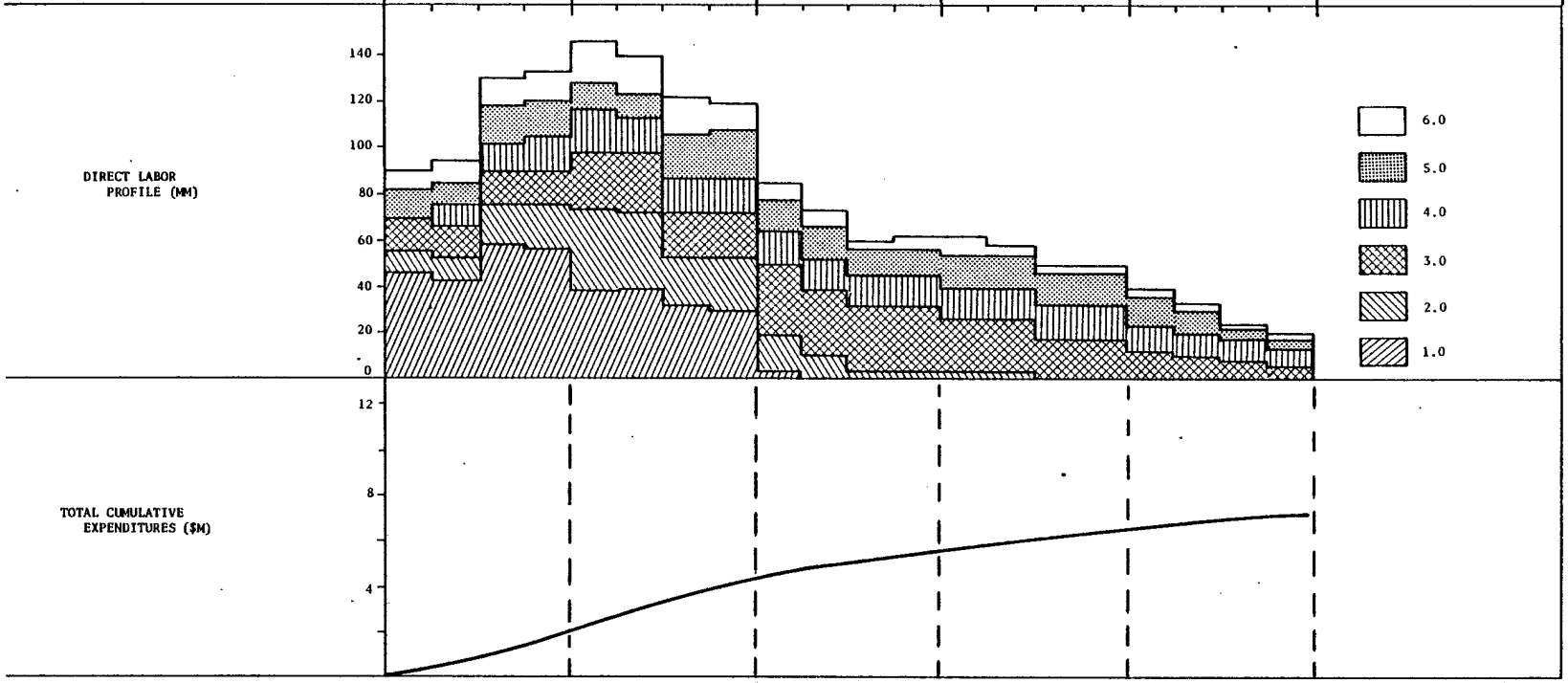

FIGURE 3 - ARP RESOURCE SUMMARY

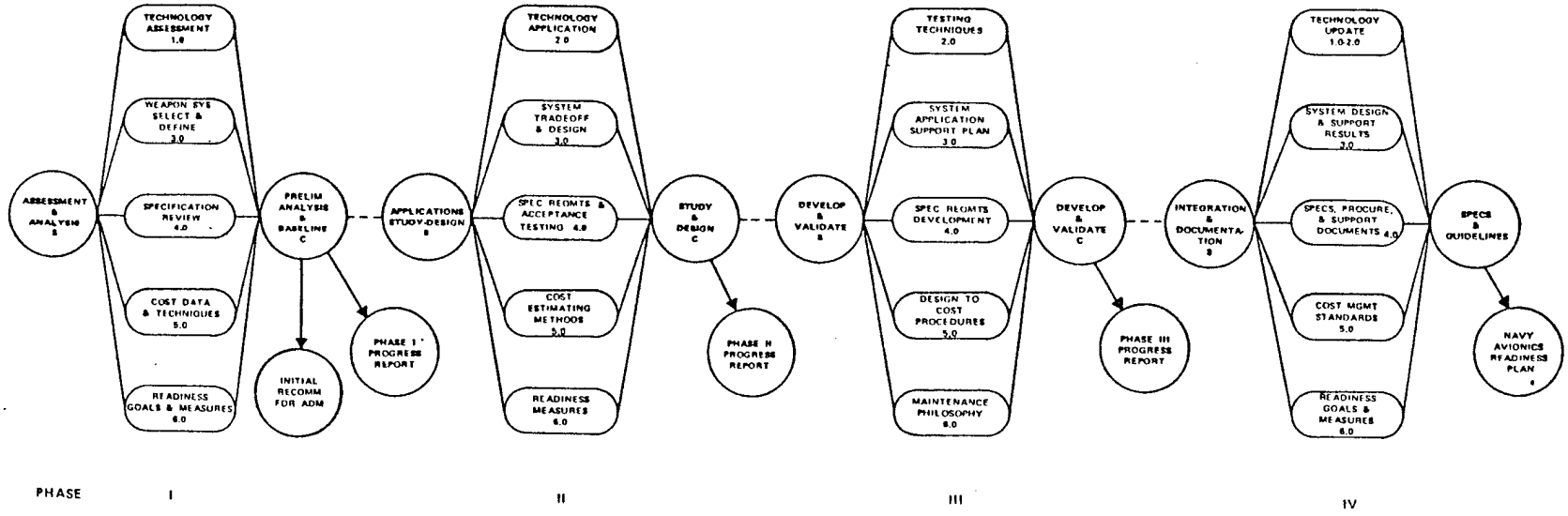

FIGURE 4 - TASK RELATIONSHIPS

SECTION 1.0

TECHNOLOGY ASSESSMENT

Statement of Work

The purposes of this section are:

a. Survey and make projections about component technologies to be used in avionics of the 1980-2000 time frame, with special emphasis on the impact of these technologies on avionics readiness.

b. Develop methods and techniques for the improvement of readiness for avionics at the WRA and SRA levels using these technologies.

c. Develop the design tools and recommended procedures for application in the construction of hardware which demonstrates Readiness features at the SRA level and which can be implemented into WRA designs in the Systems Tradeoff and Design effort (Section 3.0).

A technology and schedule projection will be prepared to develop a technology data base upon which to rest predictions, estimates, and actions proposed by the ARP. Accordingly, technologies likely to be readily available in the 1980-2000 time frame will be determined and estimates made, for each technology, of those characteristics of interest to the ARP, such as reliability, production methods, cost trends, potential support problems, etc.

Technologies to be investigated include software, analog and digital hardware, and packaging. Methods for the efficient generation of both operational and support software will be determined. (This is necessary for component technology since a great deal of software is involved in the design, fabrication, test, verification, and application of LSI circuitry and other advanced technologies.) Methods to increase the testability of analog and digital hardware will be developed. Techniques

will be developed to package these components in a manner that improves functional modularity, testability, maintainability, and other readiness parameters. These hardware, packaging, and software techniques will be integrated into general component, SRA and WRA test and repair philosophies. A continuous assessment of the commercial market will be maintained to determine the trends and sources of large volume components and to evaluate these components applicable to avionics equipments.

The efforts of this section will result in:

* A technology projection summary for use by all other areas of the ARP.

* Methods to take advantage, wherever possible, of the current design and production trends of the commercial electronics industry.

* Standards and guidelines for the design of analog and digital components and SRA's to improve readiness.

* A methodology for the cost effective specification, generation and verification of avionics related software.

* A simulation program suitable as a design and verification tool for performance and readiness factors of analog devices.

* Standards, guidelines, and design constraints for an SRA/WRA packaging philosophy incorporating functional packaging, SCT features, and the standard packaging programs now being developed.

* An integrated component/SRA test and repair philosophy for the 1980-2000 technology structure.

Figure 5 identifies the Resource requirements for this task and Figure 6 indicates the work flow within the task and relative to the other sections.

RESOURCE SUMMARY	1				2				3				4				5				PROGRAM TOTALS
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM)																					
1.1 BASIC ELEMENTS	33.0	30.0	40.0	42.0	33.5	34.5	31.0	30.0	2.0												276.0
1.2 TEST/REPAIR PHILOSOPHY			4.5	4.5	4.5	4.5															18.0
1.3 TECHNOLOGY PROJECTION SMRY	7.5	7.5	7.5	4.5					1.0				3.0				1.0				32.0
1.4 MANUFACTURING AND SOURCES	6.0	6.0	6.0	6.0																	24.0
																					350
LABOR/TRAVEL COSTS ($ K)																					
1.1 BASIC ELEMENTS	142.7	131.1	175.8	182.7	143.9	148.6	134.2	130.0	8.0												1197.0
1.2 TEST/REPAIR PHILOSOPHY			18.6	18.6	18.3	18.3															73.8
1.3 TECHNOLOGY PROJECTION SMRY	32.7	32.4	32.4	19.5					5.0				15.0				5.0				142.0
1.4 MANUFACTURING AND SOURCES	26.5	26.5	26.5	26.5																	106.0
COMPUTER CHARGES ($ K)																					
1.1 BASIC ELEMENTS	5.4	5.4	5.4	5.4	5.4	5.4	6.0	6.0													44.4
1.4 MANUFACTURING AND SOURCES				0.6																	0.6
TOTAL COST ($ K)	207.3	195.4	258.7	253.3	167.6	172.3	140.2	136.0	13.0				15.0				5.0				1563.8

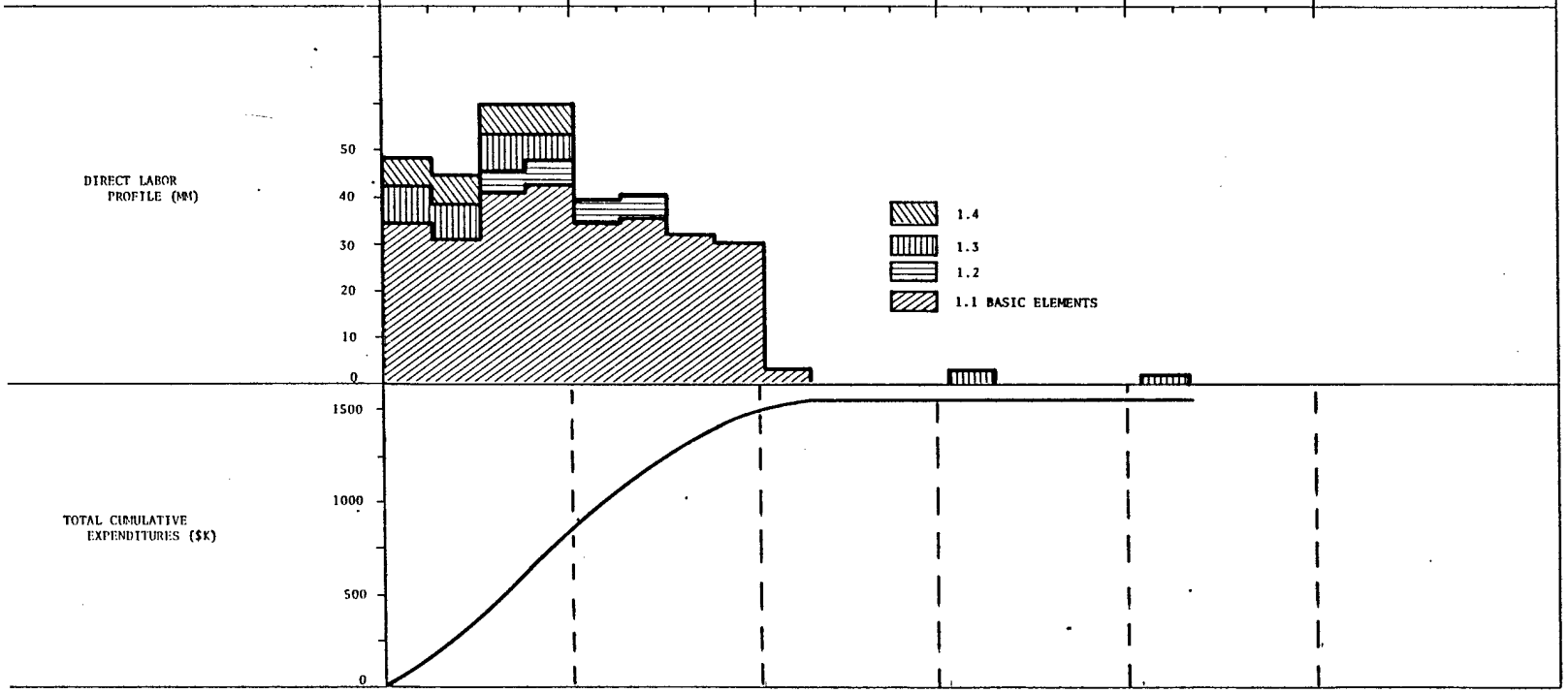

FIGURE 5 - TECHNOLOGY ASSESSMENT

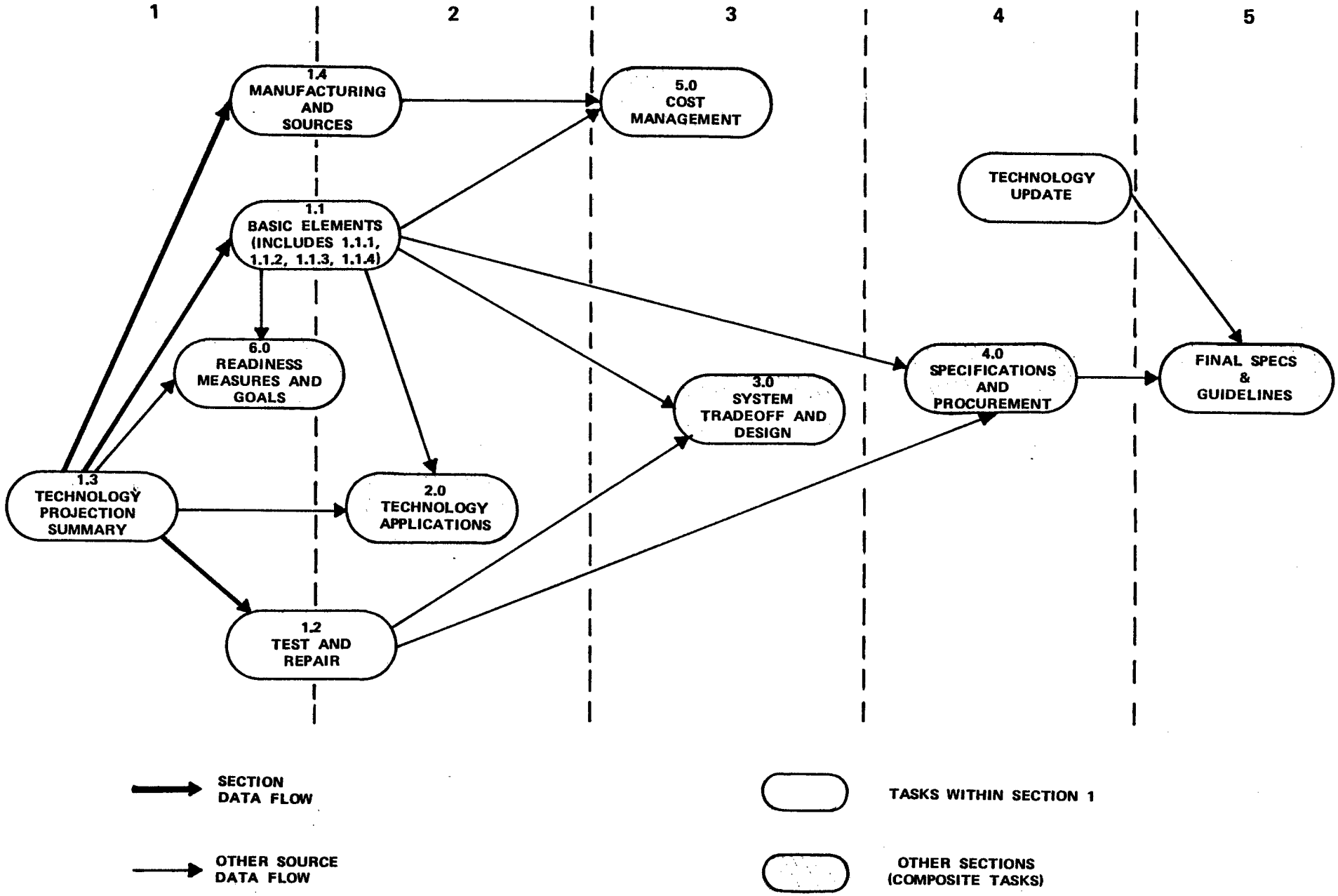

Figure 6 Section 1.0 Technology Assessment.

SECTION 2.0

TECHNOLOGY APPLICATION

Statement of Work

The objective of this section is to define the requirements for the most cost effective mix of SCT and ATE for the support of 1980-2000 avionics.

An organizational level readiness concept will be developed which emphasizes the use of SCT to provide initial fault detection. SCT capabilities and cost factors will be obtained from the efforts of Section 1 and Section 5 respectively. O-level SCT requirements will then be defined.

Analyses of SCT and ATE capabilities will be made, and test functions allocated on a cost effective basis. Emphasis will be placed on the use of O-level SCT features at higher maintenance levels. Commonality of test software at all maintenance levels will be a goal.

The impact of SCT on reliability will be determined, and factored into the SCT/ATE tradeoff studies.

From the results of the above analyses, hardware and software shop test requirements for the 1980-2000 time frame will be defined.

The efforts of work performed in this section will result in:

* O-level readiness concept for 1980-2000 avionics.

* SCT requirements for O-level readiness testing.

* Test function allocation between SCT and ATE for support of 1980-2000 avionics.

* A determination of the impact of SCT on the reliability of the avionics end item.

* Shop tester requirements for the support of 1980-2000 avionics.

Figure 7 defines the resource requirements for this section and Figure 8 displays the work flow within this section and relative to the other sections.

RESOURCE SUMMARY		1				2				3				4				5				PROGRAM TOTALS	
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
DIRECT LABOR (MM TOTAL)																							
AIRCRAFT SYSTEM TEST	2.1			3	3	9	6	9	9	3	3											45	
SCT VS SHOP TEST	2.2			3	3	6	9	9	9	9	3											51	
SCT/RELIABILITY TRADES	2.3	9	9	12	12	9	6															50	
SHOP TEST REQUIREMENTS	2.4					12	12	3	3	3	3	3	3	3	3							48	201 MM
LABOR/TRAVEL COST (K)																							
AIRCRAFT SYSTEM TEST	2.1			12.5	12.5	37.5	25	38	37	13	12											187.5	
SCT VS SHOP TEST	2.2			12.5	12.5	25	37.5	37.5	37.5	37.5	12.5											212.5	
SCT/RELIABILITY TRADES	2.3	38	37	50	50	37.5	25.0															237.5	
SHOP TEST REQUIREMENTS	2.4					50	50	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5							200	
																							837.5
TOTAL COST (K)		38	37	75	75	150	137.5	88	87	63	37	12.5	12.5	12.5	12.5								

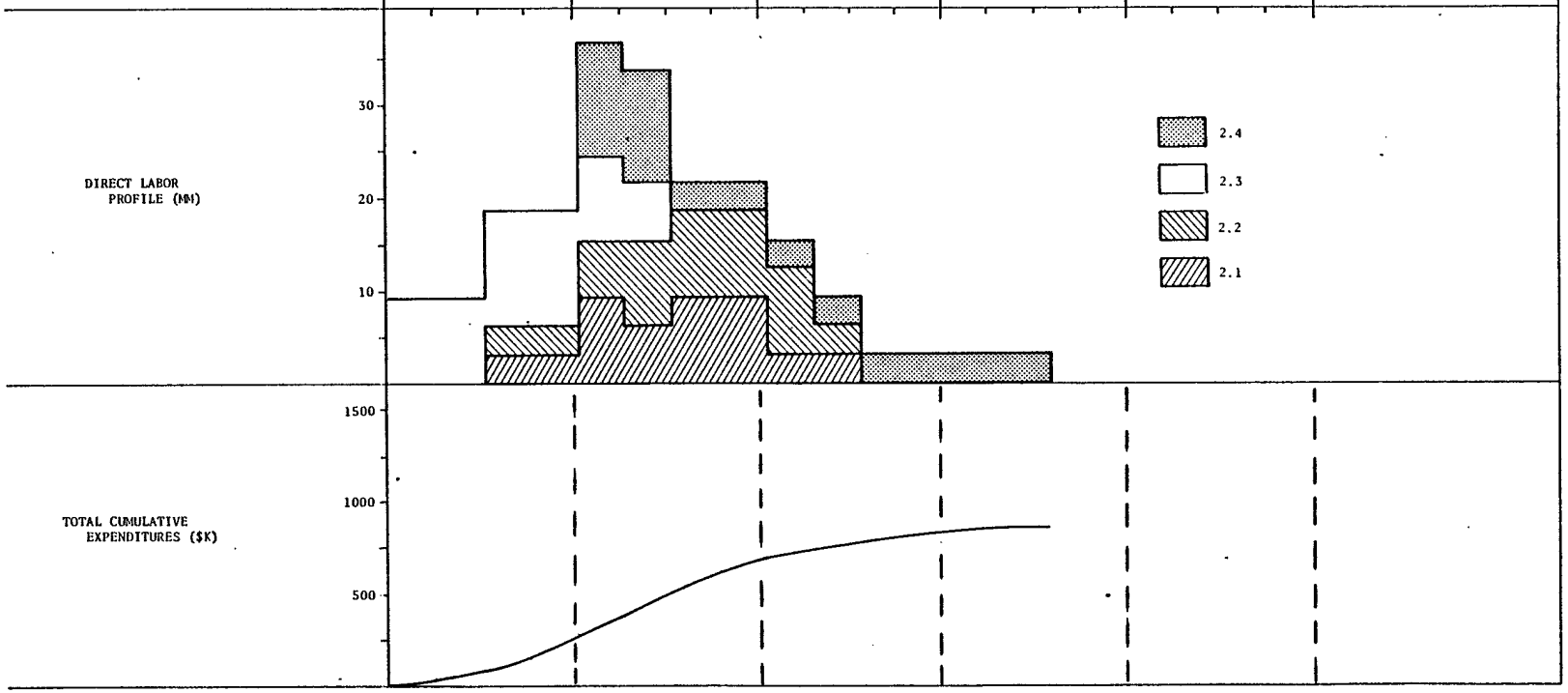

FIGURE 7 - TECHNOLOGY ASSESSMENT

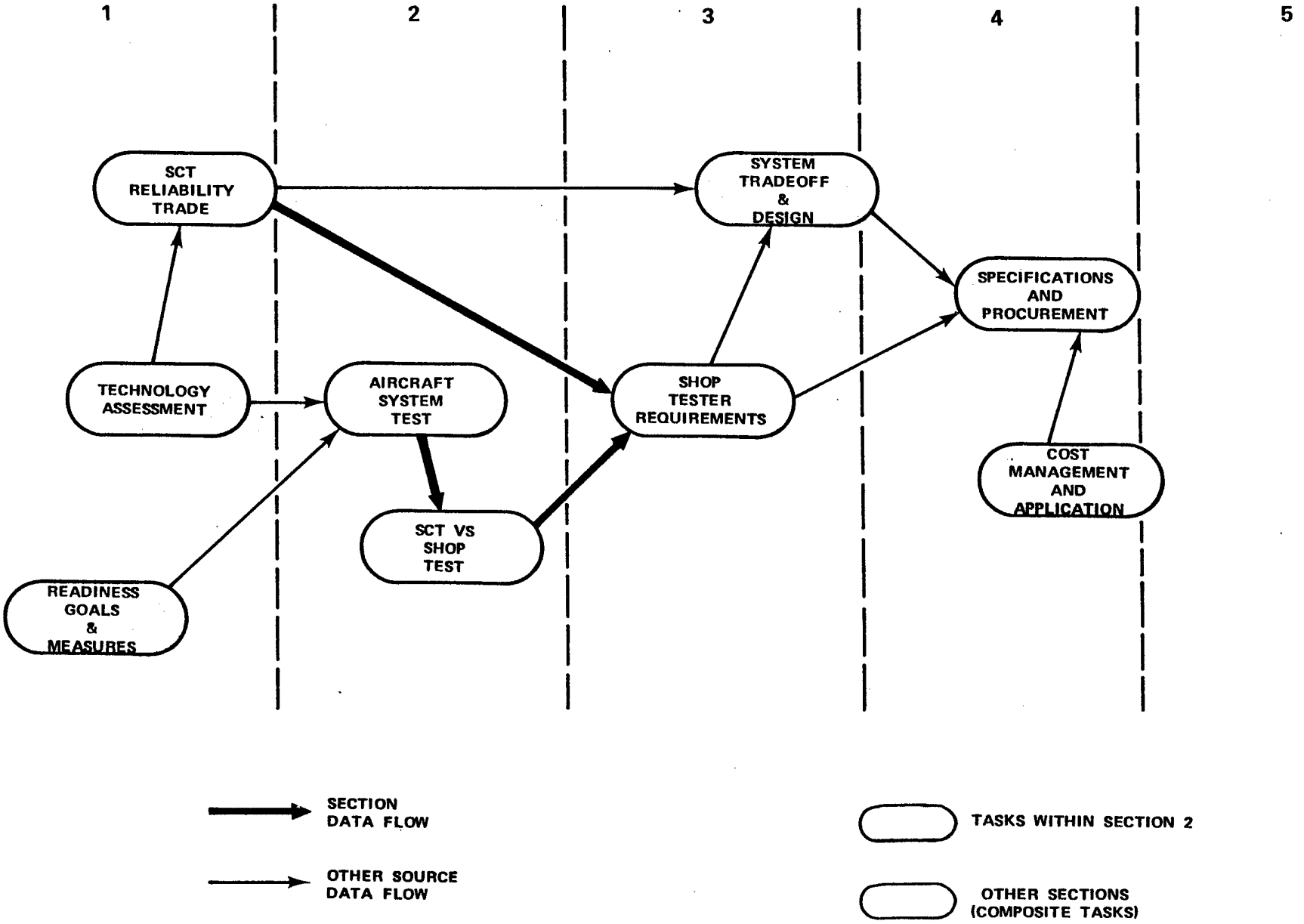

Figure 8 Section 2.0 Technology Application.

SECTION 3.0

SYSTEM TRADEOFF AND DESIGN

Statement of Work

The purpose of this section is to demonstrate Avionics Readiness through application of the principles and specifications developed in other tasks of the ARP to actual weapons systems and subsystem design, testing and human factor considerations. The demonstrations should reflect not only the specific gains of the individual Readiness influences but the advantages of combining them in a unified design, testing and operations scenario.

A major effort of this section will be the development of meaningful test and support capabilities from factory to O-level including the selection and application of principles and methods developed for Avionics Testing. Another area of activity is the development of support matrices which identify commonality of equipment parameters and characteristics to eliminate test redundancy and requirements for (Special Support Equipment) SSE and/or unique Test Program Sets.

The application of all Readiness principles and efforts to typical subsystem and system designs in order to evaluate and demonstrate the Readiness is a requirement. Cost management data developed in Section 5.0 will heavily influence decisions made in these areas. The anticipated results will provide the ability for the Navy to specify, procure and measure Avionics Readiness in meaningful, quantitative terms. An effective monitoring and feedback system introduced as part of these activities will insure timely corrections resulting from the experience gained.

Foremost in the development of Readiness capability must be the

effect of Human Factor parameters on the system concept and design. Human factors development will identify those parameters which predominantly affect man or are effected by him; to develop those which are deficient and to relate the man-machine influence through all aspects of the Avionics Readiness discipline. This effort will provide the specifications and guidelines to insure a proper balance of Human Factor issues are maintained throughout the design, development and procurement of future weapons systems.

The efforts of this section will result in:

* Human Engineering Design Guide

* Standard Test Demonstration Document

* Avionics Data Standard Documen+

* Weapons System Support Matrix

* Design, Specification and Procurement Example for Subsystem Design Procedures

* Example Design, Specification and Procurement Procedures for Full Weapons System.

Figure 9 identifies the resource requirements for this section and Figure 10 displays the work flow within this section and relative to the other sections.

RESOURCE SUMMARY		1				2				3				4				5				PROGRAM TOTALS
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM)																						
HUMAN FACTORS	3.1	6.75	6.75	6.75	6.75	8.25	8.25	8.25	8.25	6.75	6.75	3.75	3.75	3.75	3.75	6.75	6.75	5.75	3.75	3.75	3.75	119
AVIONICS TESTING	3.2	4.5	4.5	4.5	4.5	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.5	4.5	3.0	3.0	3.0	3.0	1.5	1.5	90
WEAPON SYSTEM SUPPORT	3.3									7.5	7.5	9.0	9.0	3.0	1.5							37.5
SUBSYSTEM IMPLEMENTATION	3.4					5.0	5.0	3.0	5.0	5.0	3.0	3.25	3.25	6.75	6.75	3.25	3.75	3.75	3.75	3.75	3.75	67
WEAPON SYSTEM DESIGN	3.5	3.0	3.0	3.0	3.0	4.5	4.5	4.5	4.5	6.0	6.0	6.0	6.0	4.5	4.5	4.5	4.5					72
LABOR/TRAVEL COSTS (K$)																						
HUMAN FACTORS	3.1	29.2	29.2	30.2	30.2	36.3	36.3	36.3	36.3	28.2	28.2	16.1	16.1	16.6	16.6	27.7	28.7	24.2	16.1	16.6	16.1	515.5
AVIONICS TESTING	3.2	19.7	19.7	19.7	19.7	25.9	25.9	25.9	25.8	26.3	26.3	25.0	25.0	19.6	19.3	13.1	13.2	13.4	13.0	7.2	6.3	390.0
WEAPON SYSTEM SUPPORT	3.3									32.7	32.3	39.0	38.7	12.8	6.2							161.7
SUBSYSTEM IMPLEMENTATION	3.4					20.0	20.0	12.0	20.0	20.0	12.0	13.0	15.0	27.0	27.0	15.0	15.0	15.0	15.0	15.0	7.0	268.0
WEAPON SYSTEM DESIGN	3.5	13.5	13.5	13.5	13.5	19.5	19.5	19.5	19.5	24.9	24.9	24.9	24.9	18.9	18.9	18.9	18.9					307.2
COMPUTER COSTS																						
WEAPON SYSTEM DESIGN	3.5			1.0	.5	.5				.5	1.0	.5	1.0	.5	1.0	.5						7.0
TOTAL COST (K$)		62.4	62.4	64.4	63.9	102.5	101.7	93.7	101.6	132.6	124.7	118.5	120.7	95.4	89.0	75.2	75.8	52.6	44.1	38.8	29.4	1649.4

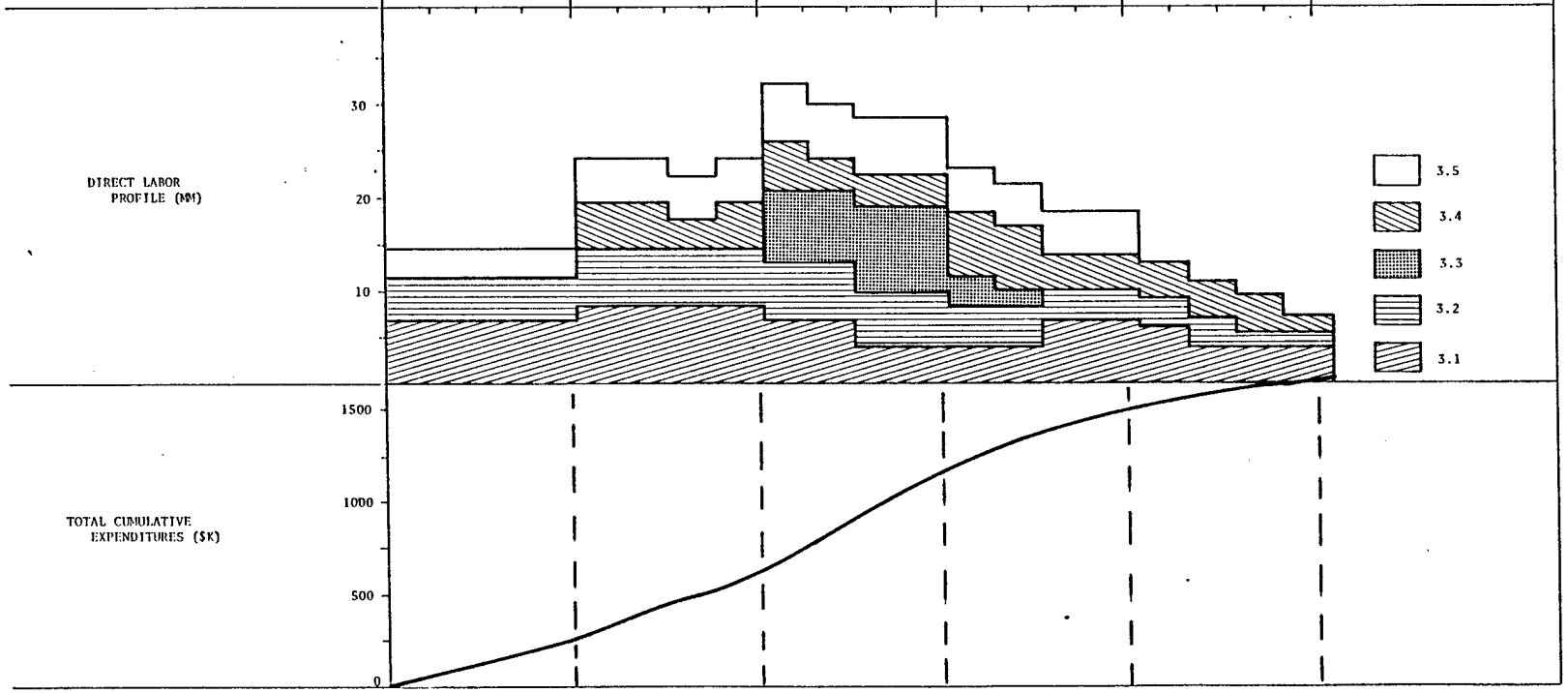

FIGURE 9 - SYSTEMS TRADEOFF AND DESIGN

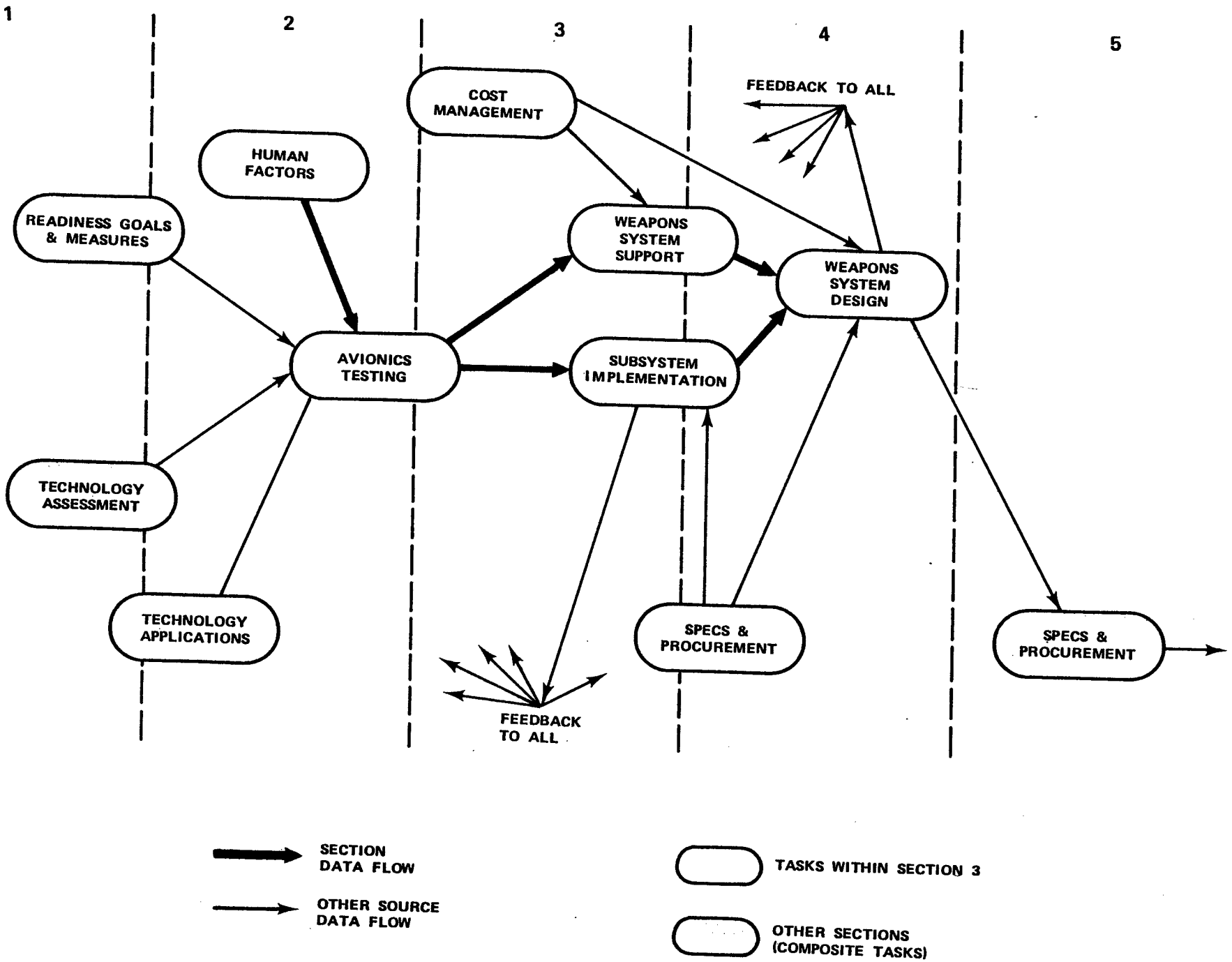

Figure 10 Section 3.0 System Tradeoffs and Design.

SECTION 4.0

SPECIFICATIONS AND PROCUREMENT

Statement of Work

The purposes of this effort are to develop new techniques for the specification, procurement and evaluation of Avionics equipment, identify the requirements for implementing and verifying Avionics Readiness, and establish a corporate memory for guidance, consultation and arbitration for specifications and procurement procedures. This section can be designated as the one producing the "deliverables" for the efforts pursued by this plan. All work efforts performed in this task area are directed toward providing NAVAIR with the necessary documentation instruments for contractual procurements of the avionics equipments and systems.

The initial effort will be to evaluate all current specifications affecting Avionics Weapons systems. Inadequacies will be identified and corrective action recommended. Eventually, new specification requirements will be developed which are applicable to future avionics systems and which properly describe the supportability, maintainability parameters and maintenance philosophy efforts developed in Section 6.0 and other tasks. In direct support of this task, methods will be developed which require the avionics manufacturer to demonstrate supportability as part of the acceptance by the government to the same degree as performance is presently demonstrated.

The model avionics procurement specification produced as the outgrowth of this work effort will (a) identify a consistent and comprehensive applicable and related documentation hierarchy; (b) contain requirements to be met which are compatible with advanced avionics equipment readiness needs; and (c) establish the provisions for assuring equipment compliance with the stated requirements as a condition of final article acceptance.

A fundamental concept currently being considered is Warranties. Although intuitively desirable, the impact of warranties on avionics procurement methods has many implications which must be considered and investigated. Foremost and interacting will be the maintenance philosophies developed in Section 6.0.

The outcome of work achieved through this task effort will be:

* The establishment of a corporate memory for guidance and consultation in the preparation of detailed specifications and procurement procedures for avionics equipments. Problems encountered by Program Managers in quantification and bounding of requirements, assurance provisions, acceptance/rejection criteria for end items, etc., will be directed to this center for investigation, arbitration and recommended resolutions.

* The advance avionics equipment Procurement Specification AV-XXXX.

* Avionics equipment/systems Pre-Acceptance Test and Demonstration criteria and plans.

* Warranty Plans to be incorporated into avionics procurement contracts.

Figure 11 identifies the resource requirements for this section and Figure 12 displays the work flow within this section and relative to the other sections.

RESOURCE SUMMARY		1				2				3				4				5				PROGRAM TOTALS
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM)																						
SPECIFICATIONS	4.1	.5	2.0	3.0	3.0	6.0	6.0	6.5	7.5	9.0	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	8.0	7.5	6.0	149.0
TESTS & DEMONSTRATION	4.2		4.8	4.8	6.3	6.0	4.5	4.5	5.4	3.0	3.0	3.0	3.6	3.6	3.6	3.0	3.0	1.5	1.5	1.5	1.5	68.1
WARRANTIES	4.3		2.5	4.3	5.6	6.0	5.8	4.5	3.7	2.6												35.0
LABOR/TRAVEL COSTS (K$)																						
SPECIFICATIONS	4.1	2.7	10.2	14.5	21.5	29.0	29.0	31.0	35.4	42.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	40.6	38.4	30.4	724.7
TEST & DEMONSTRATIONS	4.2		22.0	22.0	28.8	27.5	20.7	20.7	24.8	14.0	14.0	14.0	16.6	16.6	16.6	13.7	13.7	7.7	7.7	8.5	7.5	317.3
WARRANTIES	4.3		11.0	19.1	25.0	26.6	25.3	19.8	16.3	11.4												154.5
COMPUTER COSTS (K$)																						
TEST & DEMONSTRATIONS	4.2					2.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	1.0								23.0
WARRANTIES	4.3			2.6	2.6																	5.2
TOTAL COST (K$)		2.7	43.2	55.6	77.9	85.1	78	74.5	79.5	70.4	67	67	68.6	67.6	66.6	63.7	63.7	57.7	48.3	46.9	37.9	1224.7

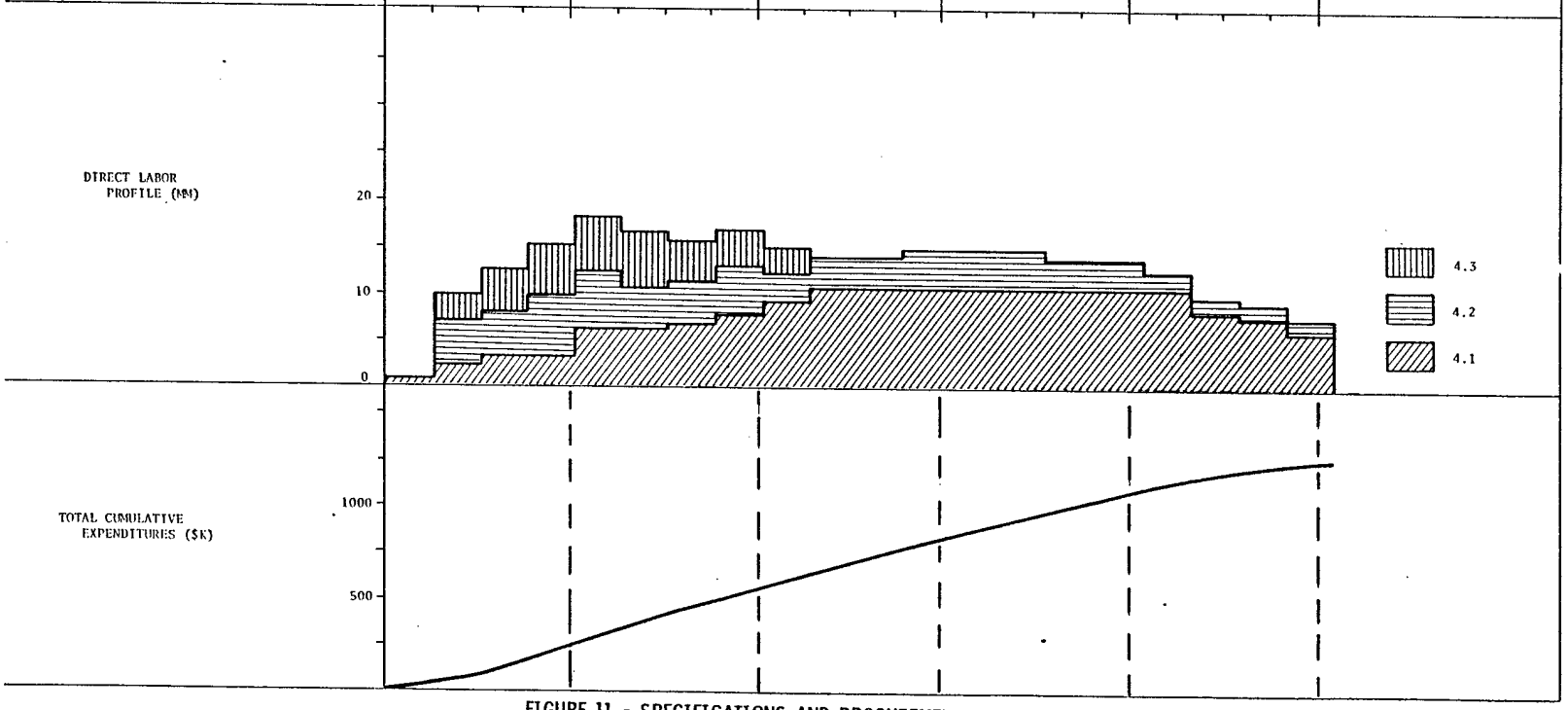

FIGURE 11 - SPECIFICATIONS AND PROCUREMENT

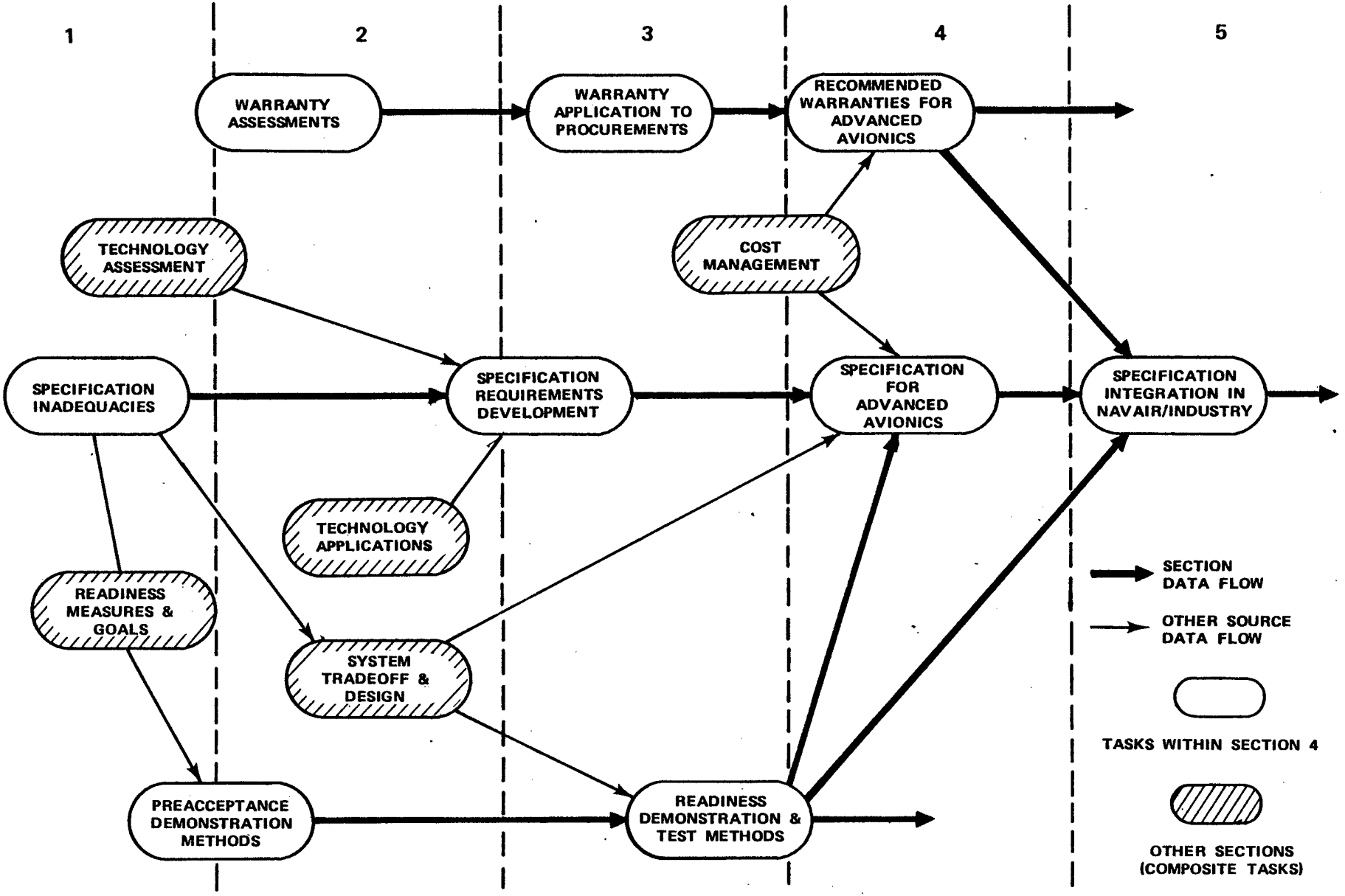

Figure 12 Section 4.0. Specifications and Procurement Program Flow.

SECTION 5.0

COST MANAGEMENT

Statement of Work

The purposes of this section are to develop viable and valid methodology for the effective management of cost related aspects of Avionics Readiness and to establish a center for Cost Management analysis consultation and guidance to support the effective acquisition of avionics equipments.

In pursuit of this task, the initial effort will be to develop a credible, firm, and structured data base from which positive and progressive planning decisions can be adequately supported. It will be necessary to develop costing methodology whereby analysis, planning, management, and evaluation can be defined in terms of LCC (Life Cycle Costs), DTC (Design to Cost), Cost Tradeoffs, etc. Cost targeting will provide the basis for establishing LCC and DTC goals based on major or significant cost centers.

The realization that cost centers are independent variables necessitates that this area be investigated continuously. The major cost elements will be identified and the relative order of magnitude of the various elements will be defined. Directly related are the Cost Indices of basic technology. These indices will be derived from the technology assessment (Section 1) and will provide the basic technology inputs for the cost management effort.

The deliverables to be derived from the effort of this task will be:

* A cost management center for analysis, consultation and guidance to support the effective acquisition of avionics equipments.

* A viable LCC profile and data base for Navy avionics systems and subsystems.

* LCC cost estimating and targeting methodology particularly directed towards the improvement of Avionics Readiness.

* Shifting cost center intelligence and cost/technology CER's (Cost Estimating Relationships) for 1980-2000 Avionics Readiness planning and management.

Figure 13 indicates the resources required for this section and Figure 14 is the work flow within the task and relative to the other sections.

RESOURCE SUMMARY		1				2				3				4				5				PROGRAM TOTALS
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM TOTAL)																						
COST CREDIBILITY	5.1	11.0	6.0	11.5	12.5	7.5	4.5	6.0	8.5	4.5	4.5											76.5
COST TARGETS	5.2									1.5	1.5	1.5	1.5	5.5	4.5	5.5	4.5	4.5	3.5	3.0	3.0	40.0
COST ESTIMATING	5.3			1.5	1.5	1.5	1.5	6.0	6.0	5.5	4.5	4.5	4.5	4.5	4.5	3.0	3.0	3.0	3.0			58.0
SHIFTING COST CENTERS	5.4							1.5	1.5	1.5	1.5	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.6			33.0
COST INDICIES	5.5		3.0	3.0	3.0	6.0	4.0	4.5	4.5	1.5	1.5	1.5	1.5	1.5	1.5	3.0	3.0	3.0	1.5	1.5		49.0
LABOR/TRAVEL COSTS (K)																						
COST CREDIBILITY	5.1	47.0	26.5	47.2	53.0	32.5	19.5	25.5	35.6	18.3	18.3											323.4
COST TARGETS	5.2									6.6	6.6	6.5	6.3	23.1	18.9	23.1	18.9	18.6	14.6	12.5	12.3	168.0
COST ESTIMATING	5.3			6.6	6.6	6.6	6.6	24.9	24.9	22.9	18.9	18.9	18.9	18.9	18.9	12.6	12.6	12.6	12.6			244.0
SHIFTING COST CENTERS	5.4							6.6	6.6	6.5	6.3	12.8	12.6	12.6	15.0	14.9	14.7	14.7	14.7			138.0
COST INDICIES	5.5		13.2	12.9	12.9	24.9	16.9	19.2	19.2	6.3	6.3	6.3	6.3	6.3	6.3	12.9	12.9	12.9	6.3	6.3		208.3
COMPUTER COSTS (K)																						
COST CREDIBILITY	5.1			1.5	7.5	5.9	3.6	3.6	3.6													25.7
COST ESTIMATING	5.3							0.6	0.6	0.6	0.6	0.9	0.9	0.9	0.9							6.0
COST INDICIES	5.5					0.9	0.9	0.9	1.0	0.3	0.3	0.3	0.3	0.3	0.6	0.6	0.6	0.6				7.6
TOTAL: MAN MONTHS (MM)		11.0	9.0	16.0	17.0	15.0	10.0	18.0	20.5	14.5	13.5	10.5	10.5	14.5	14.1	15.1	14.1	14.1	11.1	4.5	3.0	256.5
QTRLY. COSTS (K)		47.0	39.7	68.2	80.0	70.8	47.5	81.3	91.5	61.5	57.3	45.7	45.3	62.1	60.6	64.1	59.7	59.4	48.2	18.8	12.3	1121.0

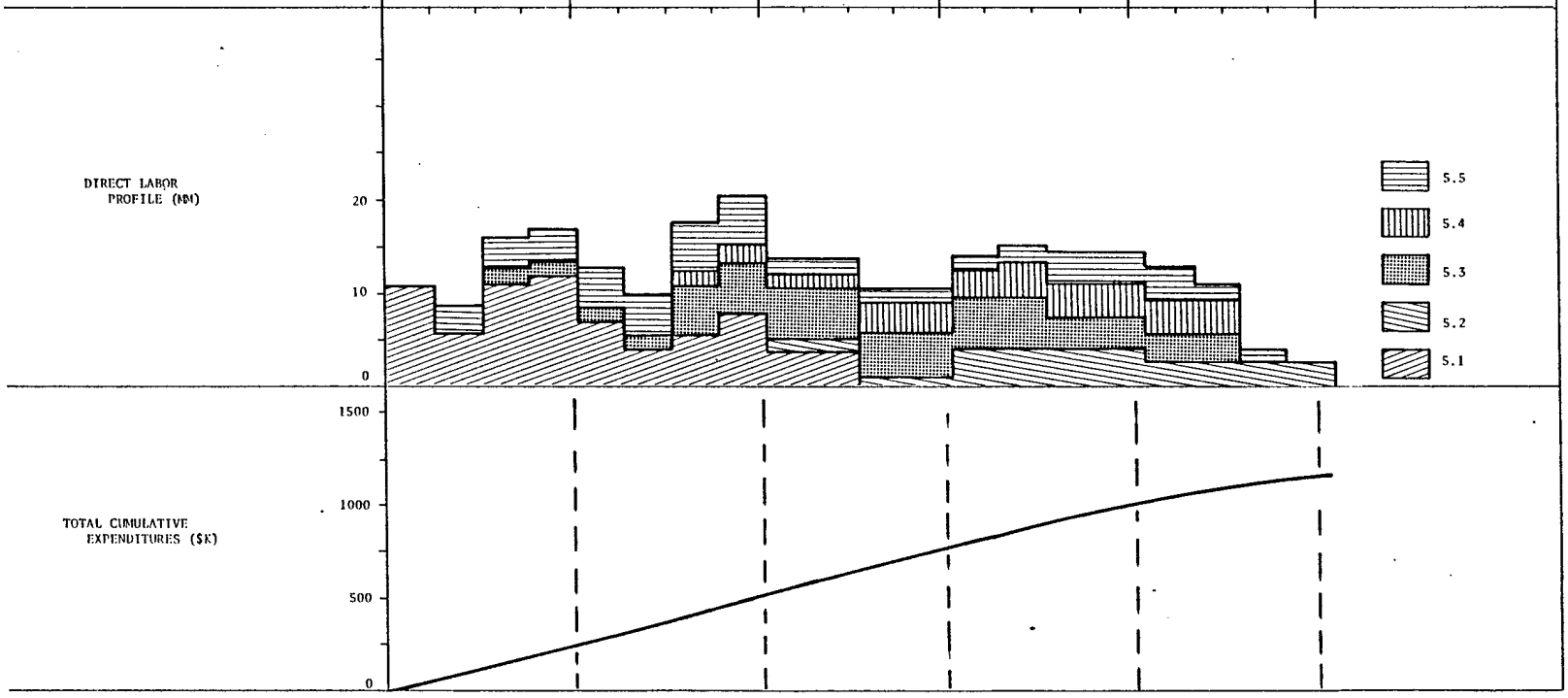

FIGURE 13 - COST MANAGEMENT

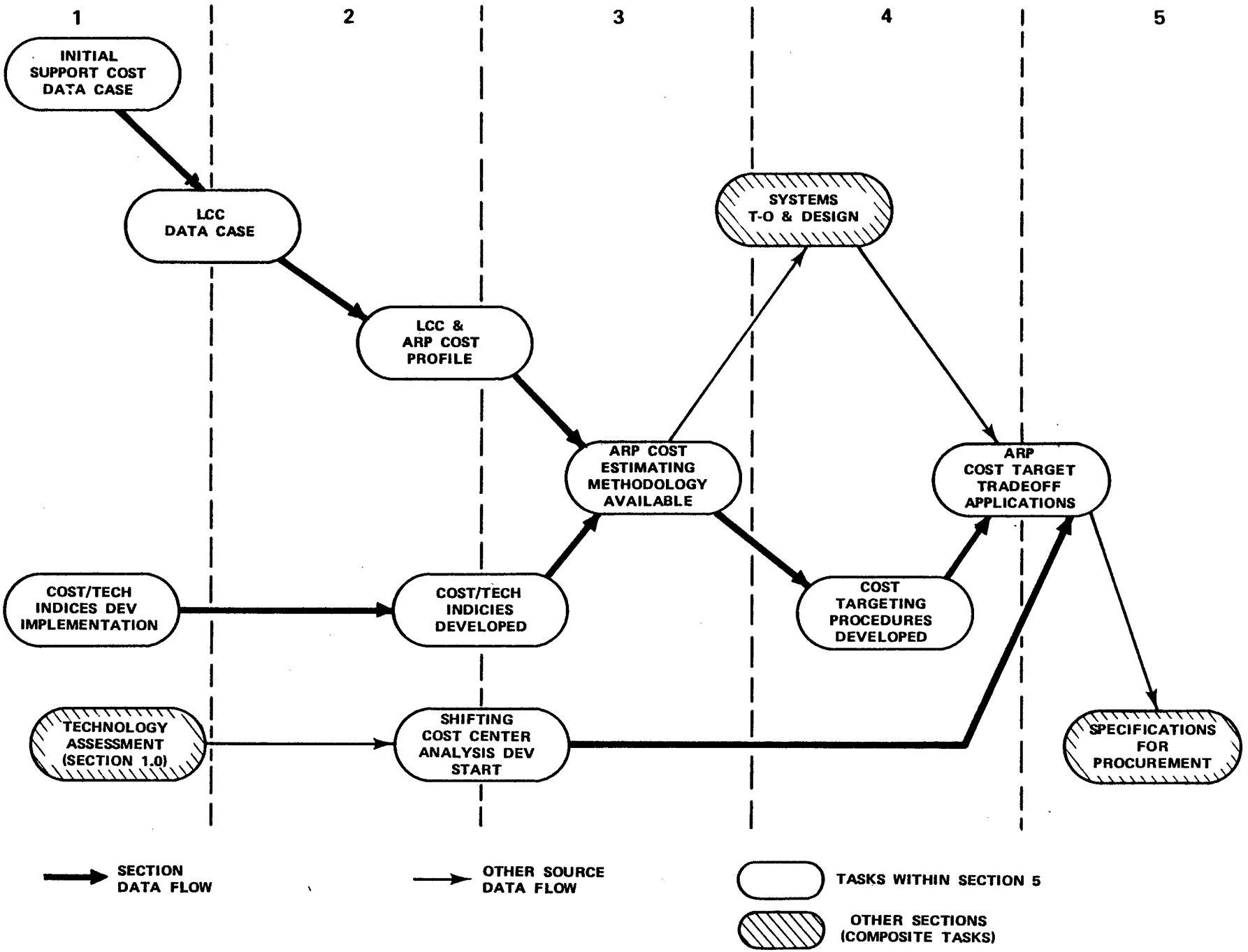

Figure 14 Section 5.0 Cost Management.

SECTION 6.0

READINESS GOALS AND MEASURES

Statement of Work

The purposes of this section are:

a. To define and validate Avionics Readiness based on the technologies and their applications projected for the years 1980-2000.

b. To identify, parameterize and quantify those elements of Readiness as defined by current and other standards and to develop the methodology for the measurement of those elements in support of the Avionics Readiness Program.

The initial effort of the Readiness Goals and Measures will concentrate on determining the many variables affecting the Readiness of Avionic systems and defining the relationship of the variables, importance or impact on Readiness, dependency and independency. When the determination is completed, a family of models will be developed which will reflect the effect of all stages of the life of avionics systems (Conception, Design, Factory, Depot, Shop, Operational) on Readiness. Additionally, a reporting scheme will be devised to support the requirements of the models. The results of this effort will be validated through application to the subsystem and system under development within the scope of Section 3.0, Systems Tradeoff and Design.

Concurrently, the Parameterization and Quantification effort will identify and validate those parameters of RMS which relate the Operational Readiness requirements to the engineering design level. The parameters will describe the basic RMS (Reliability, Maintainability, Supportability) properties of hardware/software/support system elements as well as the environmental factors affecting RMS integrity. A family

of models will be developed to quantify the parameters and to provide the methodology for applying the techniques developed.

Jointly, both tasks will provide direction to the ARP to insure the issues under consideration and the corresponding tasks of all other sections meet the goals established. These goals will be both realistic (based on the factual events and current knowledge) and futuristic (based on the projection and assumptions of technological growth). These tasks will also be iterative in that their results will be applied within the context of the ARP prior to utilization on current or near term procurements. The results will be evaluated on actual procurements as soon as practical.

The specific types of outputs produced by this task include the following:

* A definition of the scope of advance system readiness and the methods and techniques for reporting, displaying and standardizing.

* A model for measuring Avionic Readiness.

* A set of RMS and RMS environmental protection parameters.

* A model for relating RMS and RMS environmental parameters to advanced system engineering design criteria.

Figure 15 identifies the resource requirements for this section and Figure 16 displays the workflow within the section and relative to the other sections.

RESOURCE SUMMARY		1				2				3				4				5				PROGRAM TOTALS
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
DIRECT LABOR (MM)																						
ARP DEFINITION	6.1	6	6	6	6	6	6	3	3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	60
PARAMETERIZATION & QUANTIFICATION	6.2	3	3	6	6	12	12	12	6	6	6	3	3	3	3	3	3					90
LABOR & TRAVEL COSTS																						
ARP DEFINITION	6.1	25	25	24	25	24	25	16	16	6	6	7	6	6	6	7	6	6	6	7	6	255
PARAMETERIZATION & QUANTIFICATION	6.2	13	12	26	24	50	50	50	25	24	24	13	12	13	12	13	12					373
COMPUTER																						
ARP DEFINITION	6.1			4	4	2	4															14
PARAMETERIZATION & QUANTIFICATION	6.2			3	3	4.5	4.5	4.5	1.5			1.5	1.5	.5	.5	1.0						29
TOTAL COST		38	37	57	56	80.5	83.5	70.5	45.5	30	30	21.5	19.5	19.5	18.5	21	18	6	6	7	6	671

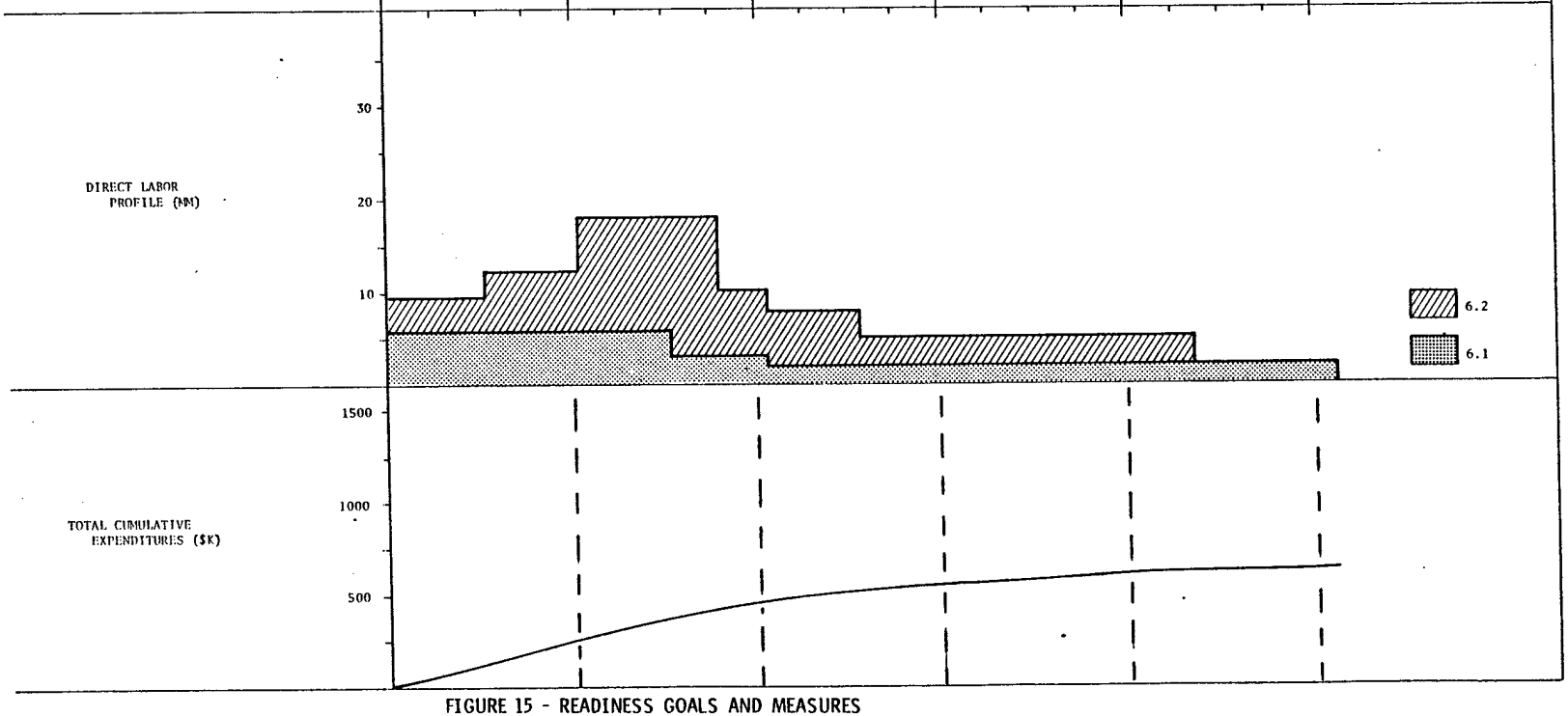

FIGURE 15 - READINESS GOALS AND MEASURES

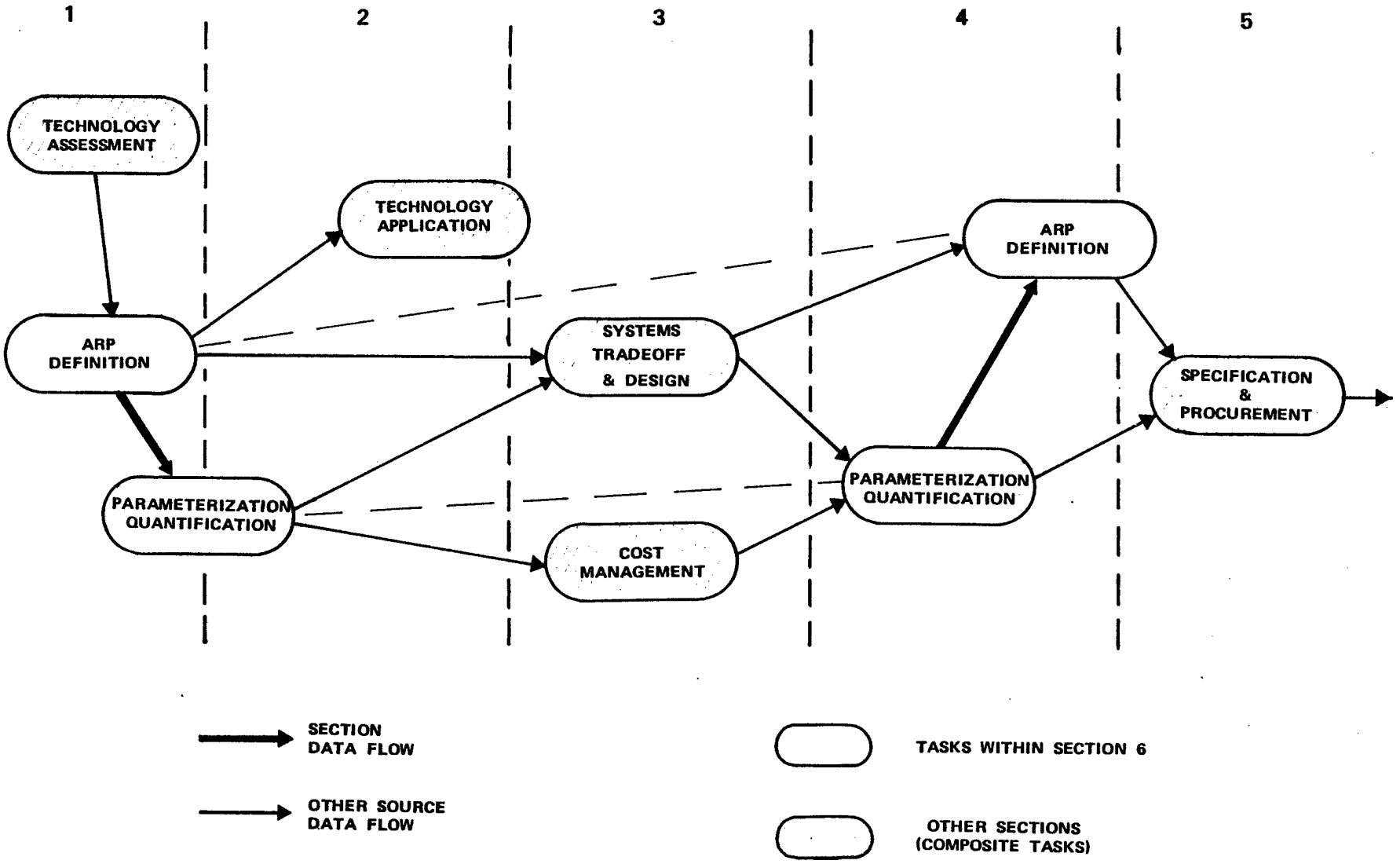

Figure 16 Section 6.0 Readiness Goals and Measures.

2.3 Project Organization

2.3.1 Introduction

The objective of this program is to establish a firm technology base, provide design and management aids, and to generate procurement specifications necessary to obtain supportable Avionics Systems planned for acquisition in the years 1980-2000. The multitude of tasks proposed by the Avionics Readiness Program to meet the objective necessitates a delegation of responsibility throughout the Navy Laboratories. The program is heavily dependent on industry support, but the direction and control of the program must be retained by the Navy to insure an unbiased, nonparochial or vested influence in the final results.

The Project Organization recommended herein (figure 17) provides the Navy with the necessary controls to effectively direct this program and to establish a corporate memory for information, consultation and guidance for Readiness related matters. It also recognizes that the expertise required to achieve successful results lies within the Navy Laboratories. All laboratories associated with Avionics development should actively participate and contribute to the effort. In this manner all Navy programs will benefit from the results.

The organization plan recommends one Lead Laboratory to insure that all participating activities meet the specific objectives of the program and to provide a central point of control for NAVAIRSYSCOM interests.

2.3.2 Specific Task Responsibilities

In accordance with the Work Breakdown Structure of Table 1, the following responsibilities are recommended:

a. Lead Laboratory:

(1) Project Manager - The PM exercises control over program plans and direction, establishes priorities and budgets, and interfaces both with the responsible Department Head within his command and with the NAVAIRSYSCOM Project Sponsor, AIR-340E. It is the PM's responsibility to provide status reports, budget expenditures and all other pertinent data necessary to meet the requirements of the sponsor. All formal reporting of completed milestones, reports or specification documentations, changes in manpower requirements, etc., will be transmitted by the parent command. Finally, the PM will be required to interface and to provide all pertinent information to the cooperating laboratories and their respective Command and Department Heads.

(2) Deputy Program Manager - The DPM provides the liaison between the Project Office and the Project Engineer. It is the DPM's responsibility to insure that the guidance and direction of the Project Manager is pursued. All interface action and discussion will be conducted at this level and the DPM will be responsible for deciding all issues in accordance with the PM's direction. The DPM will also be responsible for interfacing with and coordinating the effort of Project Engineers of other laboratories.

b. Lead Laboratory and Supporting Activities:

Project Engineer - The PE will be the individual responsible for coordinating the work within his particular Section (e.g., Technology Assessment) as well as actively pursuing one or several of the individual tasks. The PE will work directly with the DPM and provide program status reports established by the Project Office. Additionally, the PE will be required to maintain liaison and provide status reports to his immediate supervisor and Department Head or in accordance with the policies established by his activity.

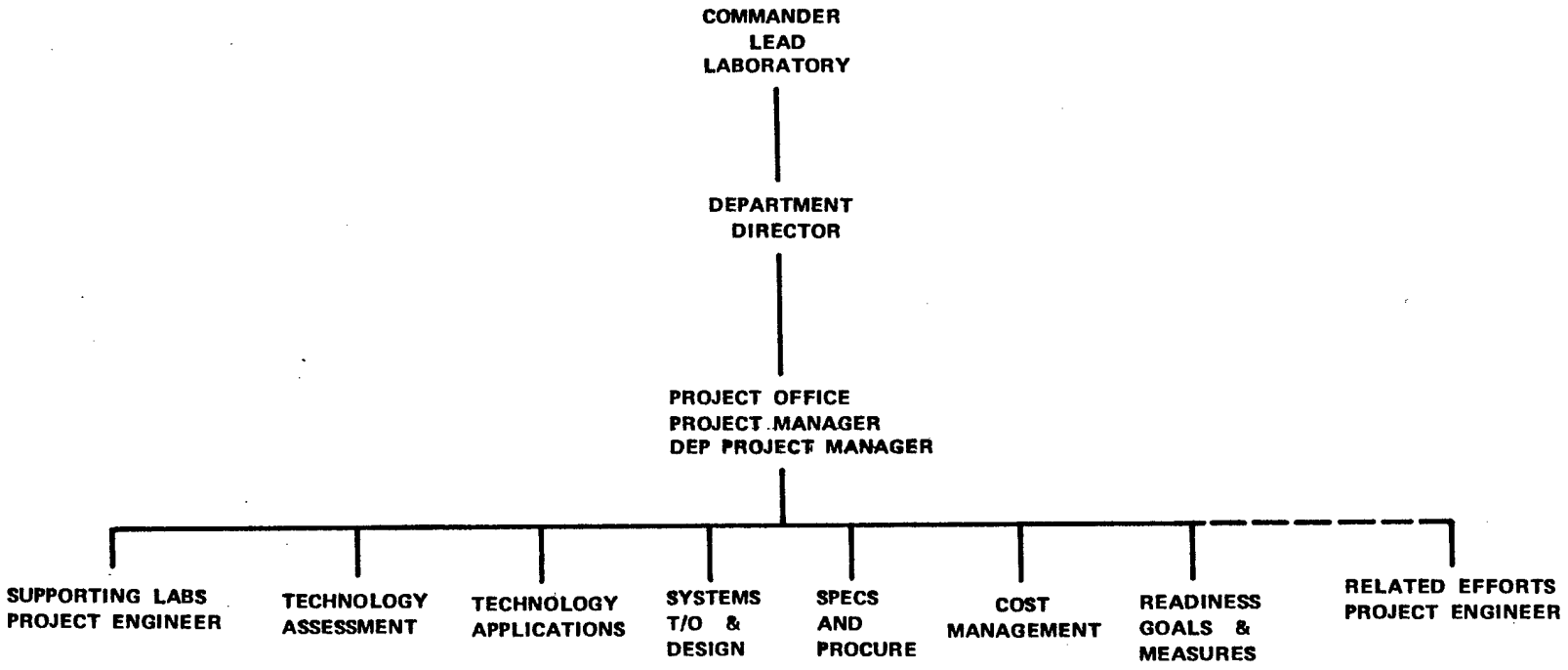

FIGURE 17 - Project Organization

AIRTASK/WORK UNIT ASSIGNMENT
NAVAIR FORM 3930/1 (REV. 9-69)

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
WASHINGTON, D.C. 20360

See NAVAIR 3900.8 or superseding for applicable details on completing this form.

Reference (a)

CLASSIFICATION
UNCLASSIFIED

ADDRESSEE	AIRTASK NO.	AMEND. NO.
Commander Naval Air Development Center Warminster, Pa. 18974	A3400000/001B/5F53537402	
	WORK UNIT NO.	AMEND. NO.
	N/A	
	EFFORT LEVEL	
	Normal	
NAVAIR PROJECT ENGINEER / CODE	CLASSIFICATION OF AT/WU	
Mr. B. L. Poppert / AIR-340E	UNCLASSIFIED	

1. The AIRTASK/[redacted] described below is assigned in accordance with the indicated effort level and schedule. Funding authorization for AIRTASKS will be provided in separate correspondence. If this AIRTASK[redacted] cannot be accomplished as assigned, advise the Commander, Naval Air Systems Command, and the NAVAIRSYSCOM T&E COORDINATOR, if applicable.

No work beyond the planning phase will be accomplished unless the addressee has funds in hand or written assurance thereof.

2. References.

a. Avionics Readiness Planning Report Vol. I of 11 February 1975.
b. Airtask A3400000/001B/5F41461408 of 17 Oct 1974.
c. NADC ltr 503-941 of 13 Feb 1975.

3. Technical Instructions.

a. Title. Avionics Readiness

b. Purpose. Assignment of effort under requirements for FY 1975.

c. Background. This Airtask covers the development of an in depth plan for Improvement of Avionics Readiness in the 1980-2000 time period. This plan will be based on the recommendations of reference a. and the guidance of the AIR-03 Technical Steering Group designated in reference b.

d. Detailed Requirements. Execute the following under this AIRTASK:

Ref.	Task Area No.	Sub-Task Plan No.	Title	Initial Est. Cost
a.	WF53-537-402	N/A	Avionics Readiness	$125,000.00

4. Schedule. Continuing effort.

5. Reports and Documentation.

a. Technical Reports. The implementation plan shall be submitted to AIR-340E in accordance with reference c. An estimated 35 copies will be required.

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SIGNATURE (By Direction COMMAVAIR) | DATE

CLASSIFICATION AND GROUP MARKING
UNCLASSIFIED

UNCLASSIFIED

b. Task Area Plans. In preparation for investigations to be undertaken during the forthcoming and ensuing fiscal years, submit Task Area Plans by 1 November and 1 May of each year, in sufficient detail at a sub-task level to enable the cognizant NAVAIRSYSCOM personnel to make an adequate appraisal for planning purposes. The original of each Sub-Task Plan shall be submitted to AIR-340.

c. Progress Illustrations. In order to assist AIR-340 in presenting current project status and defending budgetary requirements, 8" x 10" viewgraphs shall be submitted by 1 December illustrating work accomplished, in progress, or planned. These may be illustrations of the concept, block diagrams, photographs or sketches of experimental devices, or similar technical representations. Management-type information, such as milestones, funding plans, etc., is not desired in viewgraph form.

d. Program Reviews. Informal reviews will be scheduled as required. A formal review will be held at the end of the three month effort.

6. Contractual Authority. Off-station procurement not exceeding $100,000 per procurement is authorized as indicated in the applicable sub-task plans listed under "Detailed Requirements" of this AIRTASK. Each procurement in excess of $100,000 shall require prior approval of AIR-340.

7. Source and Disposition of Equipments. Not applicable.

8. Aircraft Requirements. Not applicable.

9. Cost Estimate.

a. Total estimated cost: $125,000.00

b. The initial estimate of sub-task costs listed in paragraph 3.d. supersedes those in the referenced Sub-Task Plans if any differences exist.

10. Source of Applicable Funds. Funds are provided by separate funding document being issued by NAVAIR.

11. Security Requirements. Access to classified material (up to Secret) will be required. Information classified up to Confidential will be generated under this AIRTASK.

Copy to:
Addressee (15)

NAVAIRSYSCOM, T&E Coordinator

AIRTASK/WORK UNIT ASSIGNMENT
NAVAIR FORM 3930/1 (REV. 9-69)

DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
WASHINGTON, D.C. 20360

See NAVAIR 3900.8 or superseder for applicable details on completing this form.

Reference (b)

CLASSIFICATION
UNCLASSIFIED

ADDRESSEE		AIRTASK NO.	AMEND. NO.
Commander Naval Air Development Center Warminster, Pa. 18974		A3400000/001B/5F41461408	
		WORK UNIT NO. N/A	AMEND. NO.
		EFFORT LEVEL Normal	
NAVAIR PROJECT ENGINEER	CODE	CLASSIFICATION OF AT/WU	
Mr. B. L. Poppert	AIR-340E	UNCLASSIFIED	

1. The AIRTASK/WORK UNIT described below is assigned in accordance with the indicated effort level and schedule. Funding authorization for AIRTASKS will be provided in separate correspondence. If this AIRTASK/WORK UNIT cannot be accomplished as assigned, advise the Commander, Naval Air Systems Command, and the NAVAIRSYSCOM T&E COORDINATOR, if applicable. No work beyond the planning phase will be accomplished unless the addressee has funds in hand or written assurance thereof.

2. Enclosure.

(1) Program Plan Development for Avionics Readiness Improvement of 11 Oct 1974.

3. Technical Instructions.

a. Title. Avionics Readiness

b. Purpose. Assignment of effort under requirements for FY 1975.

c. Background. This Airtask covers the development of a long range plan for the improvement of Avionics Readiness in the 1980-2000 time period. The plan will include future operational requirements, an assessment of airborne and test system technology and related logistic support elements. It will recommend areas requiring development and their scope. For additional information see enclosure (1).

d. Detailed Requirements. Execute the following under this AIRTASK:

Encl.	Task Area No.	Sub-Task Plan No.	Title	Initial Est. Cost
(1)	WF41-461-408	N/A	Avionics Readiness Planning	$50,000.00

e. Material Acquisition engineers involved in providing technical support to the Project Engineer in the planning and execution of the program are listed in enclosure (1).

4. Schedule. The schedule shall be in accordance with enclosure (1).

5. Reports and Documentation.

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SIGNATURE (By Direction COMNAVAIR) R. B. McLennan

DATE 10/17

CLASSIFICATION AND GROUP MARKING
UNCLASSIFIED

UNCLASSIFIED

a. Technical Reports. The detailed plan shall be submitted to AIR-340E in accordance with enclosure (1). An estimated thirty-five copies will be required.

b. Task Area Plans. In preparation for investigations to be undertaken during this and ensuing fiscal years, Task Area Plans may be submitted with the detailed plan of paragraph 5.a. These should be in sufficient detail at the sub-task level to enable cognizant NAVAIRSYSCOM personnel to make an adequate appraisal. The Task Area Plans shall be submitted to AIR-340E.

c. Progress Illustrations. In order to assist AIR-340 in presenting current project status and defending budgetary requirements, 8" x 10" viewgraphs may be required illustrating work to be accomplished thru the plan. These may be illustrations of concepts, block diagrams, photographs or sketches of experimental devices, or similar technical representations. Management-type information, such as milestones and funding plans, are also desired in viewgraph form.

d. Program Reviews. Reviews shall be in accordance with enclosure (1).

6. Contractual Authority. Off-station procurement is authorized as indicated in the Proposition.

7. Source and Disposition of Equipments. Not applicable.

8. Aircraft Requirements. Not applicable.

9. Cost Estimate.

a. Total estimated cost: $50,000.00

10. Source of Applicable Funds. Funds are provided by separate funding document being issued by NAVAIR.

11. Security Requirements. Access to classified material (up to Secret) will be required. Information classified up to Confidential will be generated under this AIRTASK.

Copy to:
Addressee (15)
NAVMATDATASYSGRU, Morgantown, W. Va. 26505
NAVAIRSYSCOM, T&E Coordinator

Reference (b)

Program Plan Development for Avionics Readiness Improvement

The Naval Air Systems Command has recently completed a study to determine the requirements for the development of the next generation of Automatic Test Equipment (ATE). The study recommended that new ATE must only be developed in conjunction with the new airborne system. To this end, a new program "Avionics Readiness" is being developed. It will include airborne system and ATE design in conjunction with all logistic elements. Avionics Readiness Improvement is defined as the increase in system availability through improved reliability, training, technical data and advanced testing techniques.

A review of technology with industry indicates trends toward more digital techniques and Built-in-Test with a potential reduction in Intermediate Level maintenance. This trend is confirmed by exploratory developments now being conducted and further reinforces the recommendation that a coordinated development program is required.

A detailed program plan for Avionics Readiness in the 1980-2000 time period is now required. The plan should define areas requiring development emphasis and provide direction for the ultimate production and fleet introduction of an integrated Avionics and Support system. The plan development should include the following considerations:

1. Technology Assessment/Forecast

Determine the direction and speed of technology growth and its impact on future systems and system diagnostics. The expected life of new technologies and the logistic impact of rapid change should be assessed.

2. Future Operational Requirements

Review long range weapon system planning to determine those programs which can be impacted by the Avionics Readiness Program. Determine potential Advanced Development Avionics Systems which will be applied to those weapon systems. Recommend funding level and distribution required for Exploratory Development in support of the selected Advanced Development Projects. Alternative approaches should be identified and prioritized.

3. Diagnostics/Maintenance

Requirements for diagnostic procedure development, packaging for maintenance and inter-system fault detection should be identified. The limitations of the program should be defined in terms of the total weapon system and its various levels (WRA-SRA).

4. Duration

The study should be completed within three months with informal reviews at the end of the sixth and ninth weeks and a formal review at the end of the study.

5. Technical Steering Group

The Technical Steering Group will be composed of:

A. B. Nehman	AIR-340
B. Poppert	AIR-340E
E. B. Beggs	AIR-360
B. A. Zempolich	AIR-360B
D. A. Rosso, Jr.	AIR-370
E. T. Hooper	AIR-370D

The plan for Avionics Readiness Improvement must show its integral relationship with the long range Avionics Development Plan being prepared currently for AIR-360-AIR-370.

Reference (c)

DEPARTMENT OF THE NAVY
NAVAL AIR DEVELOPMENT CENTER
WARMINSTER, PA. 18974

503

From: Commander, Naval Air Development Center
To: Commander, Naval Air Systems Command (AIR-340E)

Subj: Avionics Readiness Program Plan; submission of

Ref: (a) AIRTASK A3400000/001B/5F41461408, Avionics Readiness of 17 Oct 1974
(b) NAVAIRSYSCOM Project Review of 14 Jan 1975

Encl: (1) NAVAIRDEVCEN Avionics Readiness Program Plan, Volume I of 11 Feb 1975

1. In accordance with reference (a), 35 copies of enclosure (1) are submitted.

2. In accordance with reference (b), Volume II of the Avionics Readiness Program Plan will be submitted 90 days following acceptance of Volume I. Volume II will provide detailed task descriptions, budgets, manpower planning and schedules.

3. This command is prepared to accept the responsibility to implement the tasks identified and recommended in the plan.

J.R. TUTTLE
By direction